VOL. XXX NEW YORK—THURSDAY, FEBRUARY 5, 1914—CHICAGO No. 6

THE AUTOMOBILE

The Belgian Show

General view of the Belgian Show held at Brussels

215 Exhibitors—69 Car Makers, 18 Truck Builders and 10 Body Manufacturers

BRUSSELS, BELGIUM, Jan. 13—Belgium's thirteenth annual show, which is now in progress, is more than fulfilling expectations, its success being a direct set-back to the croakers who would have abolished it because of a rather poor year and as a protest against government taxes. Although there was a taxicab strike in the city on the day the Bourgmestre of Brussels declared the show open, and although rain fell heavily, attendance was highly satisfactory and business is reported to have been brisk. The show will receive the official visit of the King of the Belgians during the present week.

Seventeen Belgian Car Makers Show

The show unites 215 exhibitors, of which sixty-nine are automobile manufacturers, and seventeen of these Belgian firms. There are eighteen commercial vehicle makers, ten body makers, twenty-five tire manufacturers, fifty-four accessory dealers, twenty-five motorcycle manufacturers and agents, and six bicycle makers. The stands occupy an area of 135,000 square feet and the total area of the show is 236,000 square feet. The amount paid for the rental of stands is $52,000 and the gate receipts at the last show were $6,841. This indicates that about 35,000 persons paid for admittance to the show.

Belgium stands third in importance among the automobile producing countries of Europe, following France and England. In relation to her area, however, she would be placed an easy second as compared to other Continental nations.

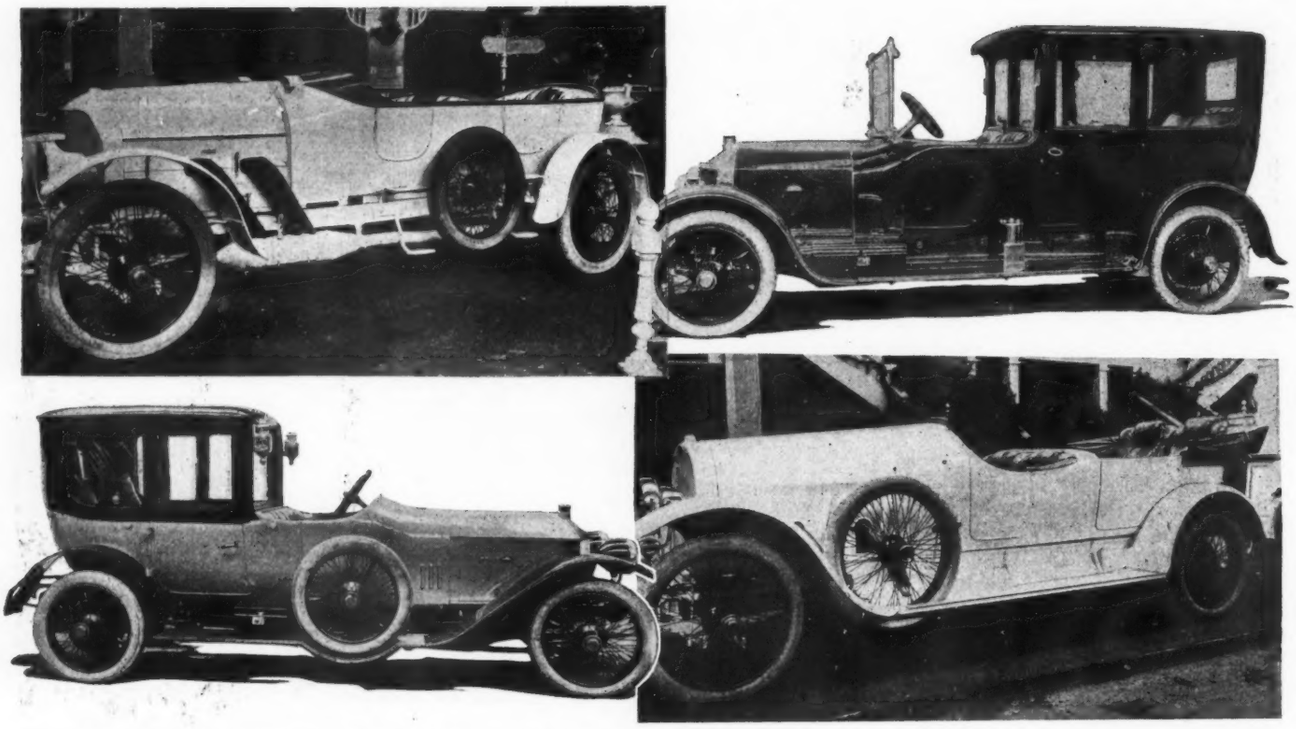
Her most important manufacturers are Nagant, Metallurgique, Springuel, Sava, Minerva, Germain, Pipe, Excelsior, F.A.B., Dasse, F.N., Elge, Fif, Linon, La Moderne. These are the Belgian firms exhibiting at the show.

Bodywork as represented by the Belgian and German schools is a strong feature at the Brussels show. In general the fashions are the same as at the London and Paris shows, with, however, a few individual notes. Particularly on closed cars the tendency is towards a slightly concave scuttle dash, lower than was formerly the case. This makes it necessary to have a higher screen than was used last year. In some cases, on open touring cars, the lower portion of the screen, about 4 inches in depth, is of glass and fixed, the upper portion being hinged at its base.

The tendency is more and more toward the rounding off of all angles and the abolition of external fittings. On touring cars the majority of the side lamps are mounted on the top of the front fenders. These latter are invariably of the domed one-piece type with no bolt-heads showing. Another common method of dealing with lamps is to set them in the lower left and right-hand corners of the windscreen, this portion of the screen being fixed. When this is done, the lamps are made as shallow as possible and are practically flush with the front of the shield.

Side Lamps Countersunk in Post

The latest method adopted by Van den Plas is to countersink the side lamps on the front door post of closed cars. This post is of course rounded off in harmony with the general lines of the car, and a recess is cut in it to receive an elongated elec-



Upper left—Springuel sporting type chassis fitted with boat body. Lower left—Van den Plas limousine on Metallurgique chassis. Upper right—Ccupé body by Van den Plas; the low scuttle is typical Belgian practice. Lower right—Opel with sporting body

tric light bulb. The bulb is protected by a hinged glass door practically flush with the post. The arrangement is remarkably neat and has the advantage of reducing the amount of metal work about the car, an effect which is now sought after by European designers.

Kellner, of Berlin, has a new method of mounting the horn on the inside of the body. This is shown on both a touring and limousine body. The horn is screwed on the inside of the front panel, just to the right of the driver, the bulb being at a convenient height and the mouthpiece screwed over a hole near the base of the panel. There is a wire gauze on the outside of this hole, this being the only external indication of the presence of a horn on the car. This same body has the left-hand front seat hinged so as to make this space available for carrying a trunk when not occupied by a passenger.

Disappearing tops are a fairly strong feature on the Belgian bodies. Van den Plas shows a good example on a Bianchi sporting type car. The top is received in a recess formed beween the upholstery and the side and rear panels, its presence being hidden by polished wood panels hinged over this recess. When the top is merely placed in a waterproof cover, the tendency is to make the top perfectly level, so as to harmonize with the line of the car, and to make it slightly lower or exactly the same height as the top of the rear cushions. In this way the top, when down, serves to lengthen the line of the car.

Provision for Tires

There are but a few cases in which provision is made for carrying spare tires under cover. The most popular of these is a barrel-shaped stern with a rear door equal in diameter to the compartment. This will generally hold a couple of wheels or three tires. In the majority of cases, however, the spare tires are carried on the running board. The forward position, with the tire half in a well in the front fender, is a common one. Seats on rails and entirely detachable upholstery is a prominent feature on touring models. There is a good example of this on a D'Ieteren body on a Berliet chassis. The four seats are mounted on rails and the four backs are independent and capable of inclination or of being lifted out entirely.

In the all-weather body class, Belvalette of Paris showed a model with the metal-frame side windows falling into a recess between the front seats and the outer panel. Each window is in three sections: a central one and two outer ones hinged to it. On being pulled out of its recess, the central window clips into position on the top rail, and the two others cover the space over the front and rear doors.

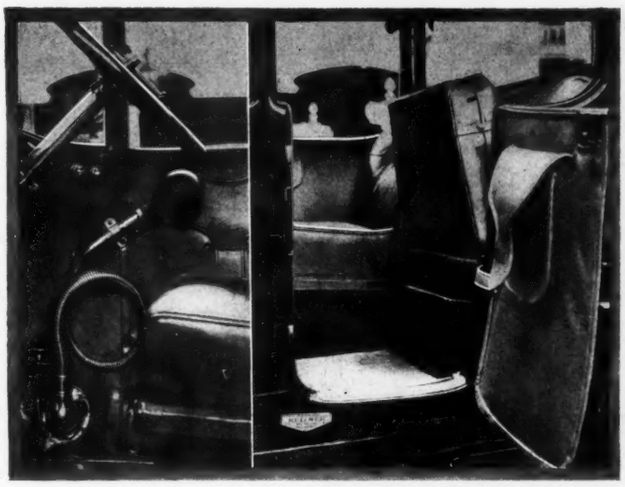
Detail of side lamps, countersunk in door post, on Van den Plas limousine

Fancy Wood Panels

Mahogany and other fancy wood panels formed a distinctive feature of closed cars. Some remarkably fine work is shown in this connection, the roof, the back and the rounded corners being lined with fancy woods without any beading and without any apparent break. This clean effect is always accompanied by frameless windows and by an absence of draperies. On some of the Kellner saloon cars a very practical effect is obtained by upholstering the rear compartment in fancy cloths and finishing the front compartment in a plain leather of a color to harmonize with the rear. The leather finish extends not only to the seats

but also to the roof and scuttle.

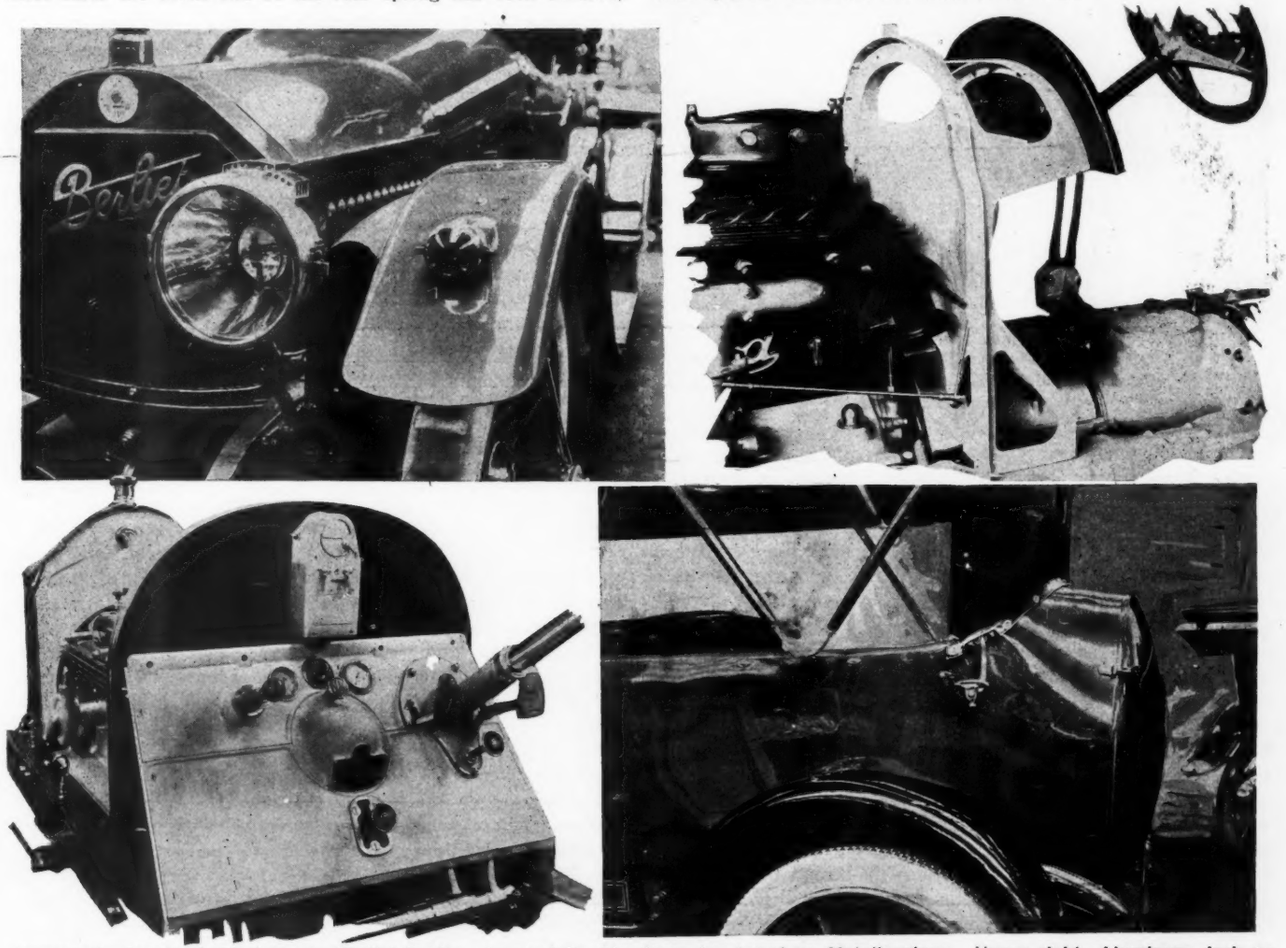
Boat type bodies, which were one of the novelties at the Paris show, are not a strong feature at Brussels. In no case is a pronounced boat-like effect sought, but merely a modification of the lines so as to incorporate a certain suspicion of a boat form. Springuel shows one of the leading examples in this class in a sporting car having a pointed radiator and pointed stern. D'Ieteren, one of the leading Belgian body-makers, shows a sporting type on a Bianchi chassis where a rather original effect had been obtained by a pointed radiator and a gradually increasing width until the greatest beam is obtained fully astern. The car has an invisible top and the back panel is made to form an unbroken line with the gasoline tank, thus giving an effect of great depth astern. Hollow-sided touring bodies are not a very strong feature, but a slight tumble home on the top rail and an absence of moulding appear to be very popular. Domed fenders forming a single piece with the cheeks are found on nearly three quarters of the higher grade cars. In most cases even the bolt heads are abolished. Cheeks between frame and running board give complete protection. In most cases the front end of the rear spring has been encased, only the shackle bolt lubricator passing through, or a door being fitted to allow of lubrication.



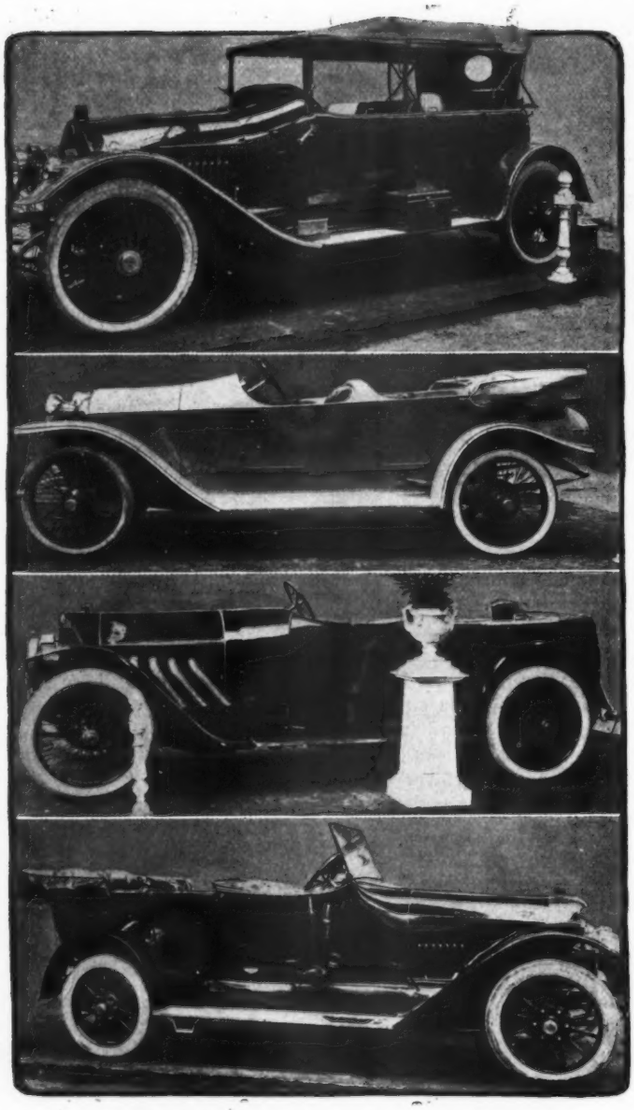
Left—Horn mounted in body with mouthpiece through side panel in Kellner body on Benz chassis. Right—Kellner body with hinged left front seat to leave room for baggage side panel

A New Metallurgique

Metallurgique furnishes one of the few chassis not shown at any of the previous European exhibitions. It is a four-cylinder block type measuring 100 by 160 millimeters, 3.9 by 6.29 inches bore and stroke and nominally rated at 26 horsepower. It is declared that this motor develops 62 horsepower at 1,800 revolutions. Detail changes with a view to simplifying the lines of the motor and chassis, and particularly in order to increase accessibility and simplify maintenance are the outstanding features of the new model. The intake manifold is now integral with the cylinder casting, the carbureter being a Metallurgique horizontal under Zenith license bolted direct to the right-hand side of the cylinder casting. There is no external heating arrangement. The exhaust manifold is separate and ribbed, but, being a straight length, it does not interfere in any way with the accessibility of the valve stems, which are hidden by an aluminum cover, having two fine gauze breathers one at each end of the cover set flush in its face.



Upper left—Detail of side lamp on Berliet fender. Lower left—Aluminum toe board on Metallurgique. Upper right—Aluminum dash on Sava. Lower right—Barrel-shaped stern with compartment for spare tires on Fab car



Top—Typical touring body by D'Ieteren
Upper middle—Vermerel hollow-side body
Lower middle—Sporting body on Bianchi
Bottom—Benz with horn mounted inside

The magneto and water pump are now driven from a cross shaft. The magneto, having its contact breaker box outwards, is absolutely accessible. The pump housing is of aluminum bronze. The two blade aeroplane type fan is now driven by skew gearing off the cross shaft; it has a clutch mechanism enabling it to be put in or thrown out of engagement, as required, by the operation of a small lever. Metallurgique retains the distinctive type of pointed radiator of which it was the originator, but has partially inclosed the rear, leaving an open space equal to the diameter of the fan. This casing tends to render the action of the fan more effective.

Although the motor has rigid four-point suspension direct to the frame members, the crankcase webs fill in the whole of the space between engine and frame, and abolish the sheet metal underpan. The crankchamber casting has been extended rearwards so as to incase the flywheel, and on the top of this casting, directly above the flywheel, the electric lighting generator is mounted. The dynamo is thus directly behind the cylinders and under the inclined aluminum dashboard. It is driven by friction wheel and belt off the flywheel, and while the front portion is accessible from under the bonnet, it can be examined in detail by removing a quick-detachable cover on the center of the toeboards. It would be hard to find fault with this position of the dynamo, for it is perfectly accessible, does not interfere with any other organ, and is well protected and free from dust and excessive heat.

No change has been made in the lubrication system, which is under pressure to the five main bearings and to the connecting-rod ends. The base chamber carries 2.6 gallons of oil, and the level is indicated by the needle of a float on the right hand side of the motor. A reserve oil tank is cast under the right-hand crankcase web and contains 1 gallon of oil. This oil can be made to flow into the base chamber by turning a three way cock on the top of the tank. Everything in connection with the oiling system is united on the right-hand side of the motor in one line. They are: three way cock allowing reserve tank to be put in communication with the sump; oil filler cap; drain-off cock for base chamber, and oil level indicator. The control levers for ignition advance are carried under the crankcase web. The only visible control levers are a straight rod going to the magneto and a vertical rod going to the carbureter.

Cylinders Are Offset

The cylinders are offset in relation to the crankshaft, which is carried in five plain bearings. Connecting-rods are of H-section and the steel pistons are made as light as possible. The aluminum dashboard is a new feature. This is not a complete dash but really a toe board to receive the various indicators. The actual dash is of wood, this arrangement having been adopted so as not to interfere with the work of the bodymaker, who is able to work the board as required to suit the bonnet or scuttle.

The gearbox, which is mounted on two underswept cross frame members, has double ball bearings at the end of each shaft and a central ball bearing on both primary and secondary. The gearbox drives two air pumps, the smaller one delivering pressure to the gasoline tank at the rear, and the larger serving for tire inflation. The air connection for tires is brought through the frame member level with the driver's seat. The connection is hidden by a cover having a bayonet type catch, and on being drawn out it puts the pump into gear. The cover cannot be closed until the pump connection has been put back, thus it is impossible to put the car in motion while the tire pump is in gear. There is a flexible connection from motor to gearbox by means of a series of steel disks. The clutch-withdrawing mechanism is inclosed by an aluminum extension from the front of the gearbox. Self-starting is by means of a C. A. V. electric motor carried below the frame member to the right of the clutch shaft and having frictional contact with the flywheel. The pedal bringing the motor in contact with the face of the flywheel also serves to put the engine on half compression.

Propeller Shaft Inclosed in Torsion Tube

Former Metallurgique models had radius rods. The new car has its propeller shaft in a torque tube with forked arms rigidly bolted to the rearmost cross frame member carrying the gearbox. The front end of the tube is received in a spherical joint in the fork member, the arrangement uniting torque and radius members in one organ. The rear axle comprises a central housing to which the two taper tubes are screwed. The differential is set up separately and mounted through the rear, where there is a big aluminum inspection cover. The design gives a perfectly smooth axle having the appearance of being in one piece. Rear springs are absolutely flat semi-elliptic 59 inches long by 2.5 inches wide. The gasoline tank at the rear carries 26 gallons and about 2.5 gallons in a reserve compartment. There is a three-way indicator on the top of the tank showing Normal and Reserve. The reserve quantity of gasoline can only be used when the word Reserve is made to appear on the dial. Brakes on the new Metallurgique are internal expanding on the rear wheels operated through an inclosed differential directly under the forked portion of the torque member, with steel band connections. The internal foot brake is to the rear of the gearbox, but between it and the forked arm of the torque member. The shaft on which the brake drum is mounted has a ball bearing at front and rear.

Sava, another leading Belgian firm, has produced a sporting type chassis with a four-cylinder block motor of 85 by 150 millimeters, 3.3 by 5.9 inches, which is claimed to develop 62 horsepower at 2,500 revolutions. In conformity with the firm's general design, the valves are superimposed, the intakes being operated by inclosed overhead rocker arms, but with the use of a single camshaft. The main change on this model, compared with last year's type, is the addition of a single-cylinder air pump mounted on the timing gear housing and driven from the end of the camshaft. The pump has its cylinder and crankchamber in a single casting of aluminum bronze, and is bolted up direct to the timing gear cover. This motor is carried direct on the frame members at four points, but instead of a sheet metal underpan extensions are cast with the base chamber to the lower portion of the frame members. The dash is entirely of aluminum with a wood facing to carry the instruments and a hollow compartment in the upper portion which can be made to receive the instruments, or to carry the gasoline or reserve oil tank. Electric lighting is a standard equipment, the dynamo being mounted on a platform bolted to the forward face of the aluminum dash, over the steering gear. In this position the dynamo is driven by belt from the flywheel.

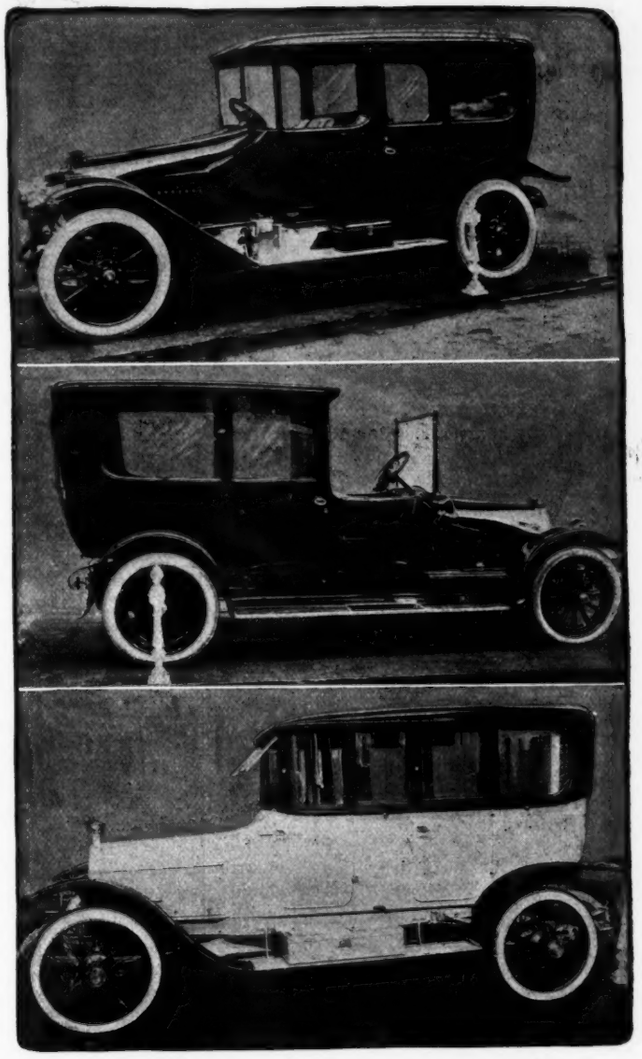
Sava carries the four-speed gearbox on two underswept frame members, and has the whole of the mechanism between clutch and gearbox inclosed in an aluminum housing forming an extension of the gearbox. The lower portion of this housing is bolted permanently to the front face of the barrel type gearbox and the upper half is readily detachable. The inclosed mechanism comprises the spring steel disk coupling and the clutch-withdrawing gear. They are protected from dust and run in a bath of oil. The change speed sector is just above the right frame member, thus coming inside the body in all cases, and is entirely independent of the frame. Sava is one of the few Belgian firms making use of a worm gear rear axle for the touring models. The worm is of the overhead type. It is worth noting that the forward universal joint is mounted on ball bearings. This construction was first adopted for racing cars, but is receiving a greater application to touring models.

Nagant Has Two New Models

Nagant has produced two new models, both of them four-cylinder block types, of respectively 90 by 130 millimeters, or 3.5 by 5.1 inches and 95 by 160 millimeters, 3.7 by 6.29 inches. They follow general tendency in the integral casting of the intake piping, the carbureter being a horizontal model bolted up direct to the cylinder casting, and by the use of a cross shaft driving pump and magneto. The barrel type gear box is employed with the entire top detachable. The foot brake at the rear of the box is external expanding and has its adjustment lever brought through the left-hand frame member.

Although electric lighting is general on Belgian cars, self-starters are not a prominent feature. In the few cases where automatic starting is provided for the electric system is employed generally with friction transmission. The only novelty in the self-starting line is to be found on an S.C.A.T. chassis, an Italian production. This firm has long used a compressed air type, with the single cylinder compresser mounted on the top of the timing gear housing. An alternative system has just been introduced consisting of a twin cylinder compresser mounted just behind the flywheel and having frictional contact with a special pulley combined with the flywheel. The pump is mounted on a horizontal transverse shaft and kept in contact with the driving member by an enclosed coil spring. It is understood that this is merely an alternative to the single cylinder compresser.

Unit construction has been adopted by but one Belgian maker. Excelsior, who makes use of it for both six and four-cylinder models. This is also the only firm making a specialty of six-cylinder motors. Although Excelsior has had success with the six, it cannot be maintained that this class of motor is looked upon with favor by the mass of constructors, and the importations show but a small number of sixes. The Excelsior six-cylinder models are respectively 85 by 130 millimeters or 3.3 by 5.1 inches, and 90 by 160 millimeters, or 3.5 by 6.29 inches. The cylinders are cast in two sets of three, and there is an independent carbureter for each set.

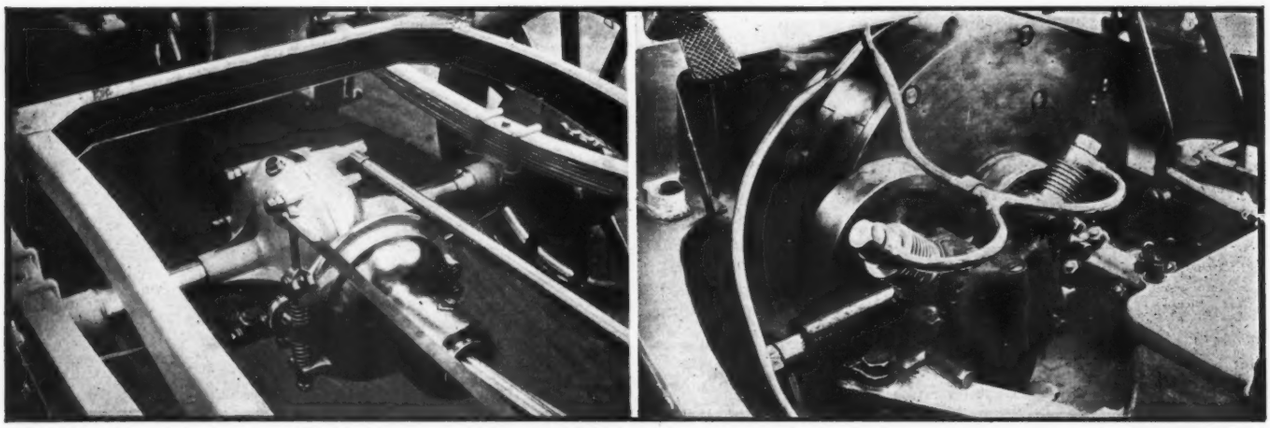


Top—Kellner limousine body with fender lamps
Middle—Van den Plas limousine on Fiat chassis
Bottom—Napier chassis with salon type of body

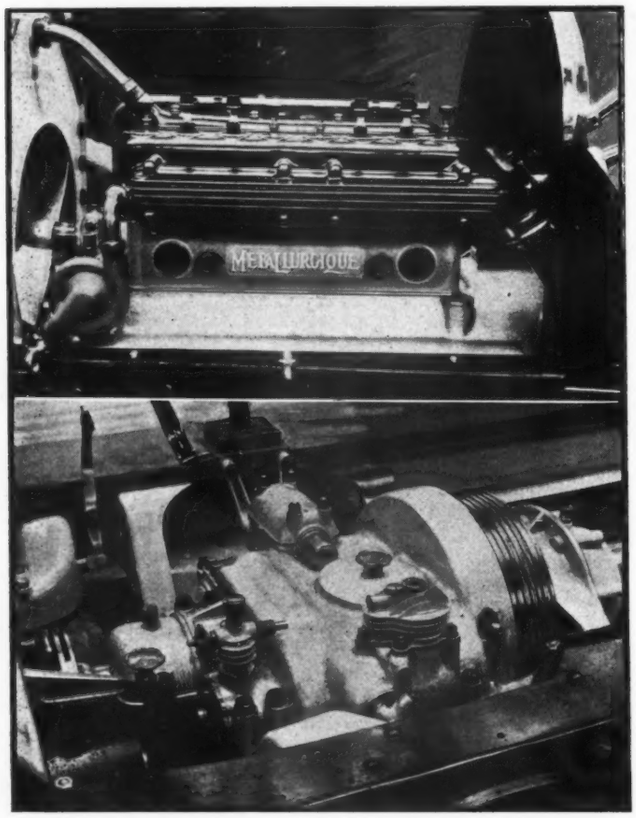
Gear-Driven Fans Popular

Gear driven fans, with a mechanism for putting them into or throwing them out of engagement as required, are an increasingly popular feature. In addition to the Metallurgique chassis, where the fan is driven by gearing from the cross shaft, the Horsch chassis has a positively driven fan by inclosed pinion and chain within the timing gear housing, Hispano-Suiza also exhibits models with positively driven fans. There is a tendency to make use of two blade fans designed by aeroplane propeller specialists. In many cases, particularly where the radiator is pointed, a tunnel is built at the back of the radiator with an opening equal to the diameter of the fan. In this way the action of the fan is effective over the entire radiator surface. This construction is seen on the Metallurgique, Hispano-Suiza, Bellenger, Delahaye, and other chassis.

With the exception of the Knight, non-poppet valve motors are not built in Belgium. Minerva is the Belgian leader with the Knight motor, making use of it exclusively for both pleasure models and commercials. Germain uses both the Knight and poppet valve models. All other Belgian firms make poppet



Left—Dasse chassis, showing brake at rear of propeller shaft next to bevel gear housing. Right—New friction-driven air pump for self-starter on S. C. A. T. chassis



Upper—New block Metallurgique with cross-shaft for pump and magneto. Note valve accessibility. Lower—Gearbox on the new Metallurgique, showing gasoline pressure pump and tire pump

valve models only. In the whole exhibition only two types of non-poppet valve models are shown. These are the Knight on Minerva, Daimler, Panhard, Bellenger, Germain and Mors chassis and the Cid rotary sleeve valve motor.

—

Trucks Exhibited for the First Time at Brussels—Minerva Has Knight Motor—New 3½-Ton Pipe

FOR the first time considerable importance has been paid, at the Brussels show, to commercial automobiles. The native manufacturers are not very numerous, but they are supplemented by manufacturers from France, England, Germany and Italy. Among the home firms Minerva has the strongest exhibit, and the outstanding feature of the firm's stand is a delivery lorry of a type accepted by one of the leading London express companies. It has been sought to get the longest possible body with the shortest possible overall dimensions and to make turning as easy as possible. With an overall length of 188 inches, the platform body measures 126 by 66 inches. The motor is mounted on a subframe in front, but is sufficiently narrow for the driver's seat to be at the right of it, and his assistant's seat to the left. It is a position which has been adopted for years on Lanchester touring cars, but has not previously been employed by Continental commercial vehicle manufacturers. There is a complete bonnet round the motor, the top and the two sides being separate parts, and each of these having trap doors through which the various parts can be reached. Thus in the top covers can be removed to allow plugs to be changed without interfering with any other part. On the right-hand side there is a door by means of which the carbureter can be flooded.

Knight Motor Employed

The power plant is a Knight motor of 85 by 140 millimeters 3.3 by 5.5 inches, with a governor limiting its revolutions to 1,000. Lubrication is by forced feed to the main bearings and constant level troughs under the connecting-rods. The troughs have four adjustments by means of a lever on the right-hand side of the crank chamber. The adjustment cannot be made without leaving the seat, but is not necessary unless very changing road conditions are met, as for instance from city streets to heavy country roads, or from level country to Alpine climbs. The motor is remarkably compact, and although the width of the vehicle is normal, as indicated by the body dimensions, there is plenty of room for a man on each side of it. The gasoline tank, containing 15 gallons, is a semi-circular vessel built on the seat between the driver and his companion and of course directly behind the motor. It really forms a continuation of the motor bonnet. The filler is a hinged cap of sufficient size for a lorry driver's hand to be passed through with ease. The radiator is of the gilled tube type with cast top and bottom tanks and a very large diameter hinger filler cap. The ends of the tubes can be reached through the filler and any one put out of circulation if it has sprung a leak. The radiator guard also serves as a protector of the starting handle.

The Minerva has cone clutch and four-speed gearbox. This latter is just to the rear of the driver's seat and can be reached for examination by lifting out the central floor board of the platform body. The gearbox is a patented type with constant-meshing pinions, and is declared to be as silent on indirect drive as on top. Final drive is by shaft and overhead worm with a reduction of 1 to 7. Springs are broad semi-elliptics all round, the rear ones being slung under the axle. Cast steel wheels are fitted, the front ones being inversely disked thus so offsetting the steer-

ing knuckles that the king bolts are aligned with the wheel planes. The lorry is designed to carry 2 1-2 tons useful load and its unloaded weight is 2 1-4 tons.

Three Saurer Models on Exhibition

Saurer exhibits 2, 3 and 5-ton models, but the novelty is the 2-ton shaft driven model with unit construction. The outstanding feature of this chassis is the inclosing of the foot brake within an extension of the gearbox. A circular aluminum casting is bolted up to the rear end of the gearbox this casting receiving the torque tube and having within it a separate compartment for the brake. There are breather holes on the casting to allow of the escape of heat generated by the brake. The two other Saurer models are chain driven and one of them has a capstan mounted on a rear platform and driven by a shaft from the gearbox. This model is one of the approved army types.

The Austin company, of England, shows one of its 2-ton models with motor under a bonnet, radiator on the rear of the dashboard, and transmission by diagonal shafts to the road wheels. Since it was seen at the Olympiá show last summer this model has undergone but few changes.

Pipe Brings Out 3-Tonner

Pipe, one of the leading Belgian automobile firms, has come into the commercial class with a very robust 3-ton truck. The motor is under a bonnet and calls for no particular attention, and the clutch and gearbox are on the same general lines as on the touring cars. An independent sub-frame, just to the rear of the motor, receives the gearset. The differential housing is carried on a separate frame and universal joints are fitted on the jackshaft. There is an elastic coupling in the clutch and also a patented type of universal joint on the propeller shaft from the gearbox to the differential. Final drive is by side chains, and the rear springs, which are slung under the axle have the unusual width of 4.7 inches. The rear attachment of the rear springs is to a sliding bar with a coil spring at each side of it. The springs are contained in a cylindrical housing and provision is made for their lubrication.

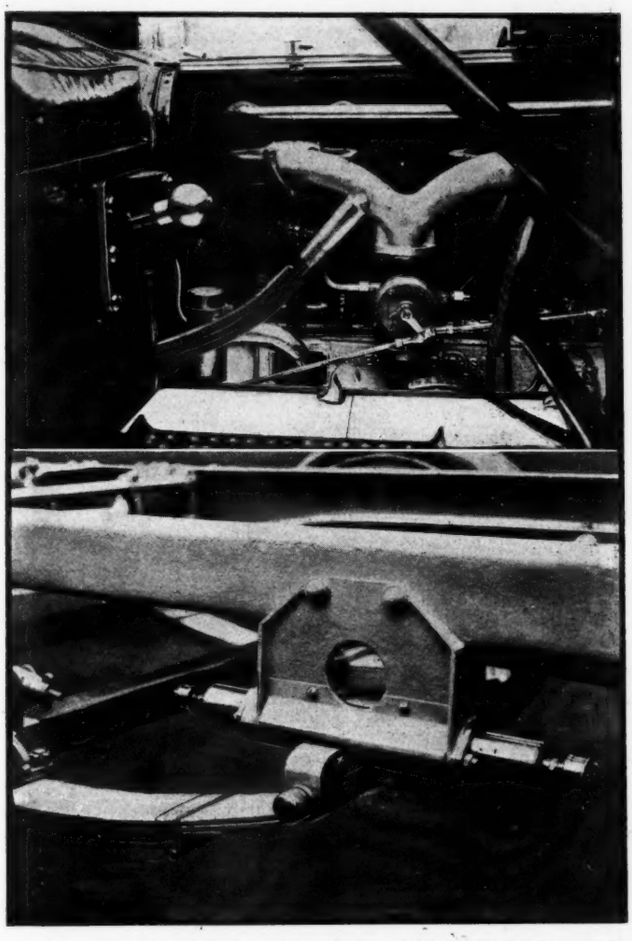
The Benz company has limited its exhibit to a single-cylinder stationary motor mounted on a bogey and having fixed and loose pulleys for transmission of power through a belt.

Belgium's Automobile Business in 1913 Totals Over $6,900,000

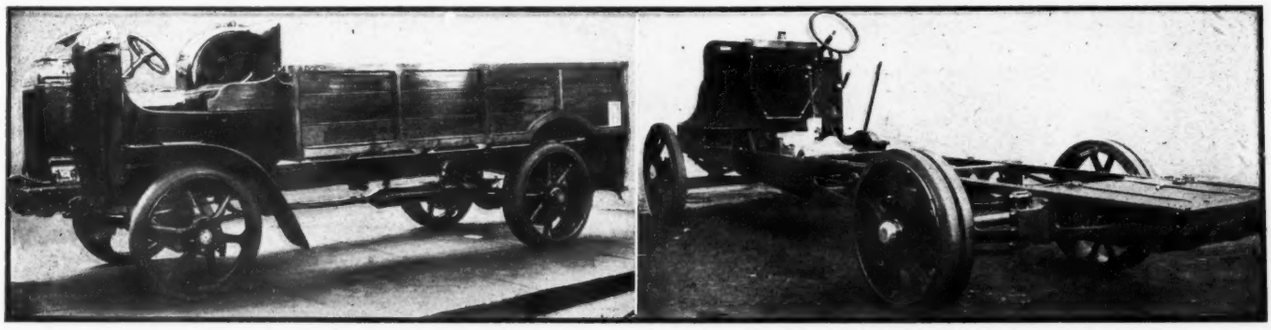
Officially Belgium's business in automobiles, automobile parts, motorcycles and motorcycle parts totalled $6,992,557 for the year ending December 31, 1913. This is an increase of $68,725 over the previous year. The country also supplies a large number of unfinished parts—stampings, forgings, castings, etc., to France, England, and Germany.

Belgium's official import returns are apt to be misleading. They show that in 1913 the value of automobile imports was $1,753,050, and that the highest ever attained was $2,064,176. French exports, on the other hand, show business with Belgium to the extent of $9,599,368 for the year 1912 and practically the same amount will doubtless be shown for 1913, when the returns are given out. This apparent discrepancy can be explained by the immense number of cars sent into Belgium for re-exportation. According to the French returns, Belgium is, and has been for a number of years, the second best customer of France, coming immediately after England. The majority of the cars sent into Belgium are not definitely retained in that country.

Apart from France, the number of foreign cars sold into Belgium is small. The leading German firms are in evidence; Italy maintains a rather strong position, but other nations are poorly represented. At this year's show the foreign firms, other than French, are Mercedes, Benz, Opel, Stower, Adler and Protos for Germany; Daimler, Austin, Napier, Sunbeam, and Rolls-Royce for England; Fiat, Itala, Isotta-Fraschini, Scat and Spa for Italy; Bianchi for Switzerland. America is represented by Ford, Hupmobile and R. C. H., with Goodrich in the tire class.

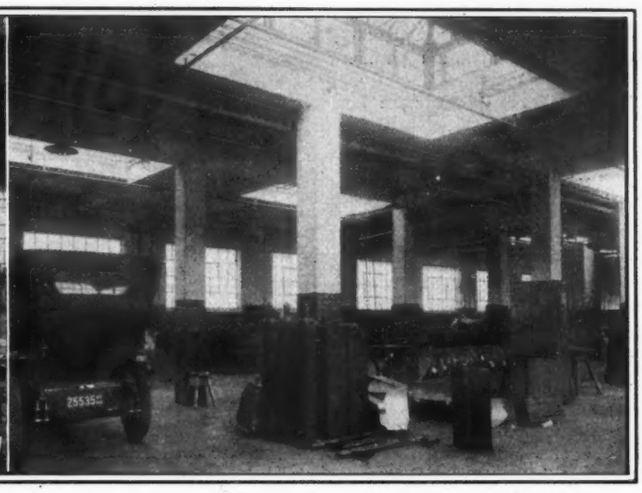


Upper—Knight motor on Minerva truck. One side of bonnet is removed, showing carbureter. Note horizontal chain speed lever. Lower—Rear spring shackle on Pipe 3.5-ton truck



Left—Minerva 2.5-ton truck for London express company. Austin 2-ton truck with diagonal driveshafts

Woodworking shop—machine for wheel assembly in lower right



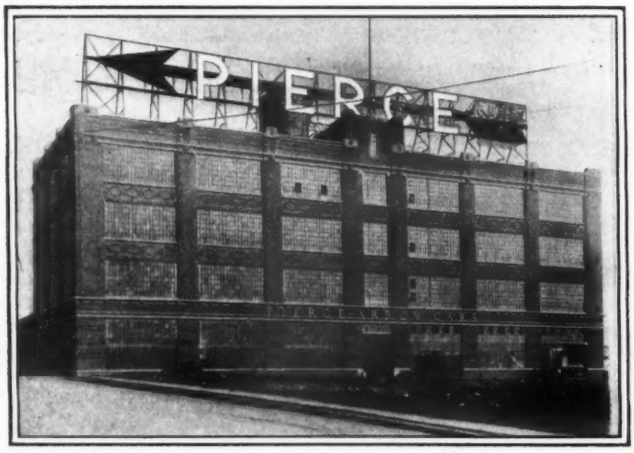
View of tinshop where fenders and radiators are repaired

Pierce Service Plant

Complete Tool Equipment—Separate Floor for Each Department

FIFTEEN minutes drive from the showrooms of the New York distributors of the Pierce-Arrow, the Harrolds Motor Car Company in West Fifty-fourth street, there has recently been completed a building that typifies the Pierce-Arrow idea of service. It is on Freeman avenue between Fifth and Sixth avenues, Long Island City, a few blocks east of the Queensboro Bridge Plaza and just off Jackson avenue, which is the artery of east and west bound travel along the north shore of the island. It was designed by Griffin & Wynkoop, New York City. Steel frame and concrete construction with an entire absence of wood or other inflammable trim render it proof against fire, while a facing of buff brick gives it an attractive finish not obtainable with the former materials. It extends 200 feet along Freeman avenue at the junction of the latter with Jackson avenue, occupying the entire block front and is 200 feet deep on the side avenues, with a 50 by 100 foot one-story extension on the Fifth avenue side.

The foundations and steel framing have been designed for the erection of a four-story building, but for the present only one-half of the main building, measuring 200 by 100 feet, has been carried to this height. This gives a floor space of 100,000 square feet, capable of accommodating 500 cars at a time, and is considerably larger than the original Pierce-Arrow factory in Buffalo. The main floor has a 20-foot ceiling, while all of the upper floors have been built with 14-foot ceilings, making it possible to accommodate the 5-ton trucks with furniture or similar high bodies requiring a 12 1-2-foot clearance, as the building is designed to provide service for the Pierce-Arrow trucks as well as the pleasure cars. With this object in view, a 30-foot electric elevator of 20,000 pounds capacity has been installed, in order that a fully loaded 5-ton truck may be lifted to any of the floors. A passenger elevator is also provided.



Exterior of new Pierce service station. Note large window spaces

Travel between the different floors is minimized by locating a different department on each floor. On the main floor, which measures 200 feet square, all chassis repair work on both passenger cars and trucks is done and so we find the machine shop, tool room and part of the stock room conveniently located across one end. And in a wing adjacent to the stock room the sheet metal work and the blacksmithing is turned out. On this floor also are the general offices, the chauffeur's room and a lavatory. The rest of the stock room takes up the main part of a mezzanine floor that extends over these rooms and also up along the Freeman avenue side of the building over the general offices.

The second story is devoted to carpenter and upholstery work. This includes body and wheel repairs, and the fixing over of cushions and tops. The third is set aside for dead storage and on the fourth is found the paint shop.

Overhauling Done on Main Floor

Looking at the main floor plan the general arrangement of the offices and the various departments is seen at a glance. The offices are located on the left convenient to the entrance, thus simplifying the clerical work required when a car is brought in. Back of these is the department in which overhauling of the motor, gearset and rear axle units is carried on. The machine shop, tool room and stock room are placed across the back of the building and the remainder of the space on the first floor is used for storing cars that are being overhauled. The latter is about 160 feet square and is divided into three sections separated by two wide aisles. The front section is devoted to light repairs and adjustments and work on electric starting and lighting units. Here also at the right is found a large wash rack.

The next section is used for truck repairs and the third for passenger car overhauling. These two sections are equipped with traveling cranes for the removal of bodies, motors, etc.

The machine shop is notable for its complete equipment, there being a large assortment of lathes, planers, milling machines and drill presses as well as the various smaller tools that go to complete such an installation.

The equipment includes four grinders, two Heald machines for cylinders, and two Norton tools, one for crankshaft refinishing and another for all kinds of small work. In this connection it is interesting to note the way valve grinding is done, as the time-honored method of grinding the valve into its seat by means of emery and oil has been abandoned. Instead the face of the valve is given a high polish in one of the Norton grinders, the valve being held at the correct angle by a special fixture, and the valve seats are finished by milling cutters made for this purpose. The fit of the valve in its seat is then tested by means of Prussian blue and no valve is passed upon as long as any high-spots are to be seen.

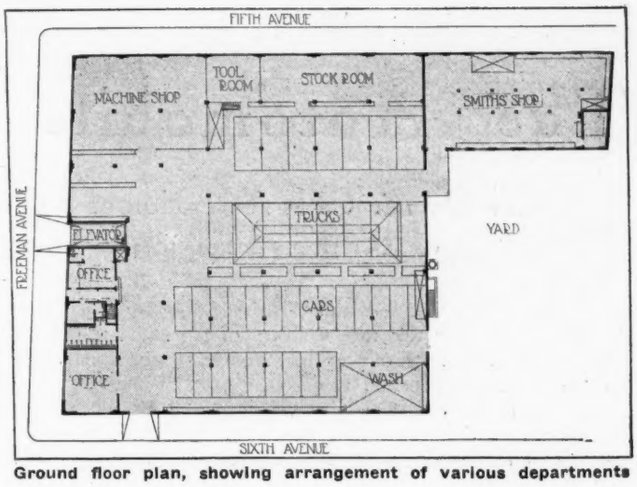
Among the features of machine-tool equipment is a one hundred and fifty-ton press for putting tires on the five-ton trucks, while a smaller press is provided for other work. All of the benches in the machine shop are piped for compressed air, while outlets are also provided on all the columns and around the walls of the main floor to facilitate the use of the pneumatic tools, no hand work being done where power can be employed.

The tool room, measuring about 25 by 30 feet, contains, besides the ordinary stock of dies, taps, mandrels and the like, a large assortment of special tools designed to save time, these include wheel pullers, bearing pullers and valve cutters. In the tool room, also, a large variety of bar stock is carried so that material is not lacking for making special parts of any description.

Stock Room a Model of System

The stock room is a model of neatness and systematic arrangement. Small parts that can be stored away in drawers are found on the lower floor while upstairs on the mezzanine the larger parts such as wheels, cylinders, axle housings and frames are placed. Receiving and shipping are done from the upper floor, the shipping office being adjacent to the large elevator.

On the main floor, instead of storing the parts in bins, large steel cabinets containing drawers of various sizes are used. These cabinets are arranged laterally. Each is divided into several vertical sections, and there are a number of drawers in each section, the larger drawers being at the bottom. The drawers are in turn divided into one to eight compartments. Of special interest is the method of indexing these compartments so that any part can be obtained in a few seconds. The cabinets are lettered and so are the sections in each cabinet while the drawers are numbered. Now when an order for a certain part comes in its order number is looked up in the stock room index and the location of the drawer obtained. For instance if the part number is 13,372 on looking this up the address of the drawer would be found to be C-B-32 and so the clerk goes to B, the second section in cabinet C, and immediately picks out drawer 32. The advantage of using this system of indexing is that each section is a complete unit and a change in the number of drawers in it or for that matter the alteration of a whole section will not interfere with the consecutive numbering of the other sections.



Ground floor plan, showing arrangement of various departments

A unique plan for getting parts from the stock room without loss of time has been adopted. Orders are delivered to the stock room by a pneumatic tube system, there being a tube line running from every foreman's desk on the main floor.

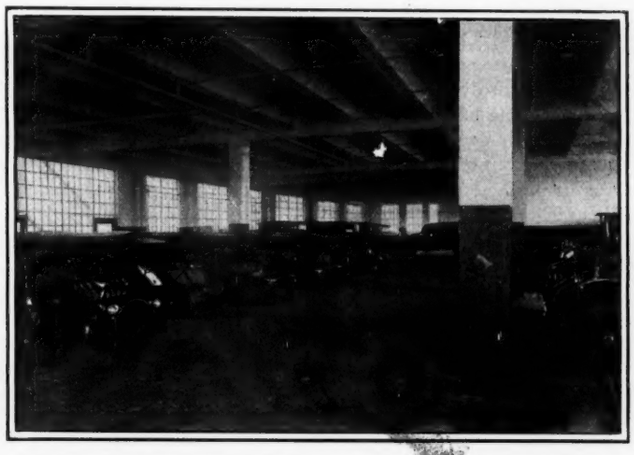
The wing to the right of the stock room houses the forge shop, battery room and it is here that the sheet metal work such as the making of fenders is done. Radiator repairs are also made in this department. There are two large water vats in which the radiators are tested for leaks by means of air pressure.

On the second floor is found a wood working shop with band saws, circular saws, planers and special tools for making wheel repairs. Of special interest is a wheel assembly machine for pressing the spokes into the wheel hub. It consists of a number of radial arms that operate on the outer ends of the spokes and is designed so that an entire set of spokes can be forced into the hub in one operation.

The third floor is devoted to dead storage, and the number of bodies compared with complete cars here is noticeable, showing that a great many owners are using two bodies in connection with one chassis, a limousine body in the winter and a touring body in the summer. When a car is brought in to be stored it is washed thoroughly, the water drained from the radiator, and then it is jacked up and the tires deflated.

The paint shop is located on the fourth floor, and as this is the top floor it is unusually well-lighted, there being several large skylights. At one end are two glass-enclosed finishing rooms. In each is a turntable on which the car is placed, thus allowing it to be turned so that the workman always has the light in the right direction no matter what part of the car he is working on.

Third floor, showing the number of bodies in dead storage



Main floor looking from Sixth Avenue entrance towards stock room

The Automobile Engineers' Forum

Car Owner Calls Attention of Engineers and Manufacturers to the Fallacy of Rushing Production—Costs Time and Money in the End

OROVILLE, CAL.—Editor THE AUTOMOBILE:—In March, 1913, the writer took delivery of a popular-priced car turned out by one of the strongest American manufacturers whose production is near the head of the list. The model was a new one, late in coming out, and presumably the factory rushed the earlier cars especially. My car was one of the first of that model to come to California. Presumably this fact is responsible for the unsatisfactory performance of the car, since later cars have had many of the details corrected before they left the branch house.

The list of mistakes enumerated herein; the unsatisfactoriness to the user; and the annoyance to the agent and the branch house of the maker in making adjustments and corrections, should present a solid argument to this firm to see that future models are tried out and completed before they leave the factory, however late that may be. The firm in question advertises its dependability, and, no doubt, desires to perpetuate a reputation which has been deservedly won.

New Radiator Necessary

The following are some of the experiences with the model:

The radiator in the California climate, heated up excessively. It was discovered that the pump discharge was such that the pump forced the larger portion of the water through the overflow before it began to heat up. A new radiator was furnished by the manufacturer with a properly designed baffle which corrected the difficulty.

The carbureter originally furnished had a decided tendency to flood. It appears that the later cars of the model were equipped with a later model carbureter of the same make but that the Coast branch had not been instructed. After several unsuccessful atempts to furnish extras for the original carbureter the later model was sent complete. Continued confusion resulted to get correct connecting parts for the new instrument. Finally after it was installed and two later replacements made, it continued to flood. The carbureter was an untried one and not up to the reputation of the maker, having one marked quality, that of cheapness. Finally the maker's carbureter was abandoned and another make successfully installed by the owner.

Paints Blistered and Flaked

Early in the use, the body paint blistered and so loosened from the metal as to come off in flakes making a complete repainting necessary, one half of which was paid for by the manufacturer.

A spoke in a rear wheel showed up broken square across, early in the running of the car. This had presumably been assembled in an imperfect condition. The wheel was replaced by the manufacturer.

After a few hundred miles, the brake lining of the emergency brakes burned out. Examination during replacement showed that the lining furnished by the manufacturers was not metal-woven according to the present standard, but was a fabric which charred and wore out very quickly.

The adjusting nut for the main transmission shaft thrust bearing was not securely retained. This was later corrected by the manufacturer by a lug applied to an adjacent part.

The high and intermediate positions of the gearshift showed a tendency to work back to neutral. This was corrected by the manufacturer by a new push rod having deeper annular notches.

There were no cross-acting springs to bring the gearshift lever to the center of the "H" bracket. These were later supplied by the manufacturer.

The main clutch collar was lubricated in an inaccessible manner. The result was that the collar got hot. This was corrected by the manufacturer by carrying a flexible tube from trunnion of collar to a grease cup conveniently accessible.

Replacements in Rear Construction

The rear construction, including differential main bevel and rear axles, proved inadequate and required replacements.

The body doors were so carelessly fitted that no door would close with ordinary effort. All doors had to be refitted by the owner.

The upholstery dressing was of such nature that black stain came off very easily on the passengers' clothing. Seat covers were put on by the owner.

The only apparent excuse for so much correction to a car which has run less than 2,500 miles appears to be in over zeal to put a model on the market quickly.—C. G. LEESON, A. S. M. E.

Advantages of Six-Cylinder Motor Over Four-Cylinder Type Revealed by Power Curves

DETROIT, MICH.—Editor THE AUTOMOBILE:—From our observation we have come to believe that motorists in general are still in the dark regarding the respective functions of four and six cylinders. Most of them are ready to give the matter a little study.

Though the charts shown in Figs. 1, 2 and 3 may, at first sight, appear a bit intricate, they are easy to understand and are also true. The charts are based on the system employed for plotting curves by the Society of Automobile Engineers.

Fig. 1, at the left, shows the power curve of a four-cylinder motor. This curve starts on the Zero circle, at which point the charge is fired in No. 1 cylinder.

At first the rise is gradual, due to the fact that the explosion's force is partly spent in overcoming compression and the inertia of the moving parts. The power then shoots rapidly upward, turns and descends again to Zero.

At the precise instand the curve reaches Zero the charge is fired in the second cylinder. Up shoots the curve again. The process is repeated until all four cylinders have fired.

There are two prominent features of this diagram to bear in mind.

There is a point after each power impulse of a four-cylinder motor, in which power is at Zero—Nothing.

At Zero, the idle mechanism is suddenly driven to reneweo action by a tremendous blow—a blow communicated to the piston, connecting rod, crankshaft and every gear and moving part of the entire car.

In the center, Fig. 2, is the power curve of a six-cylinder motor. The curve, as did the one in the preceding column, begins at the intersection where No. 1 cylinder's charge fires.

Upward rises the force to 1 and then descends until the second cylinder fires. The power rises again and continues the cycle.

But it never drops to Zero.

At the lowest point the power of the first explosion is still

being delivered, nor does it cease until the rising curve of the next power impulse is well on its way.

For a considerable period, both first and second explosions are working together. And the latter part of the second explosion helps speed the third upward curve.

In other words, the motor of the six is never idle. There is a continuous stream of power flowing through the shafts to the work of driving. In this fact lies the supreme merit of this type of motor.

At the right, Fig. 3, is a diagram showing the power curves of a four and six-cylinder motor combined, the motors being of the same cylinder dimensions and general design. The four curve has been plotted in dotted lines and the impulses designated by letters, instead of numbers.

The most interesting feature is the circle, showing the average power of the two types, the six motor's superiority being so plainly superior as to banish all chance of argument.

A study of this chart also shows conclusively why a six-cylinder motor is so notably free from vibration and its deteriorating effects; why a six will keep pulling on high gear at a speed so slowly that a four motor would surely stall; why the six is able to spring almost instantly from 3 miles an hour to any desired speed, without a change of gear; why a six is more efficient in its ratio of miles to gallons of fuel.—PAUL HALE BRUSKE, The Studebaker Corp. of America.

Inventor of Knight Motor Finds A. C. A. Laboratory Efficient and Equipment Complete

CHICAGO, ILL.—Editor THE AUTOMOBILE:—I wonder how many engineers and others interested in the scientific study of the internal combustion motor in this country realize the facilities which are afforded by the Testing Laboratory of the Automobile Club of America at the clubhouse in New York, for scientific testing of high-speed internal combustion engines.

I must say that I have been greatly surprised and much gratified at the perfection of the arrangements of this laboratory for thorough research.

It must be admitted that the most valuable data obtainable comes from the experiences of the disinterested. The inventor, manufacturer or designer of a mechanism is nearly always loath to subject his product to the drastic trials which it is likely to receive at the hands of the unfeeling and unsympathetic public, and for this reason the judgment and record of such a laboratory is of inestimable value.

The equipment of the club's laboratory is extremely complete, and the work of testing in charge of most courteous, capable and conscientious heads and assistants. What is of great value to the patron of this laboratory is the advice and assistance of those who have had experience along the lines he is investigating.

A most gratifying feature of my experience with this laboratory in the recent 337-hour continuous test of the Moline-Knight motor was the business-like, systematic methods of Superintendent Chase and his assistants, and their untiring efforts to keep their records and reports abreast of the work of the testing room. The promptness with which the bulky and complicated details of this tremendous test were classified, analyzed and put in form for publication by the engineering department and the comprehensive manner in which it was compiled and published to the world, reflects great credit upon Mr. Chase and his staff.

I may say in conclusion that my experience with the capacity, methods and personnel of the Automobile Club's Laboratory will in future cause me to regard its report of any test with the utmost confidence.—CHAS. Y. KNIGHT.

Thinks Lamps Will Burn at Battery Voltage Despite Different Voltage at Generator

BRATTLEBORO, VT.—Editor THE AUTOMOBILE:—In the discussion going on in THE AUTOMOBILE between Mr. Mercer and Mr, Newbold regarding the voltage of the lamp circuit when the battery is "floated" on the line, it seems to me that Mr. Mercer must be right and it makes no difference how high the voltage is at the generator, the lamps will burn at battery voltage as long as the battery is connected. The little sketch, Fig. 4, shows what I mean. We have a 6-volt battery charging from a 110-volt generator. R is resistance inserted in one of the wires to control the charging rate. A and B are 6-volt lamps. Now it makes no difference with the brilliancy of these lamps whether the voltage of the generator is 125 or nothing. The switch may be thrown out or in at will and there will be no change in the lamps. But if the wire running to the battery is broken, as at C, the lamp A will be instantly burned out, while lamp B will not be affected in the least.

Regarding the power required to furnish electric lights for an automobile, some of the correspondents seem to think it makes a serious drain on the power of the motor. Suppose the lamps required 8 amperes, which is ample for head and tail lights. Eight amperes at 6 volts mean 48 watts, or a little more than 1-16 horsepower. This is less than is required to run the fan.—CHAS. A. SMITH.

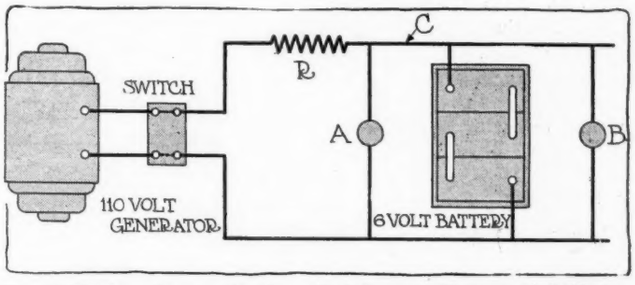


Fig. 4—Wiring diagram to show that lamps will burn at battery voltage, irrespective of the voltage at the generator

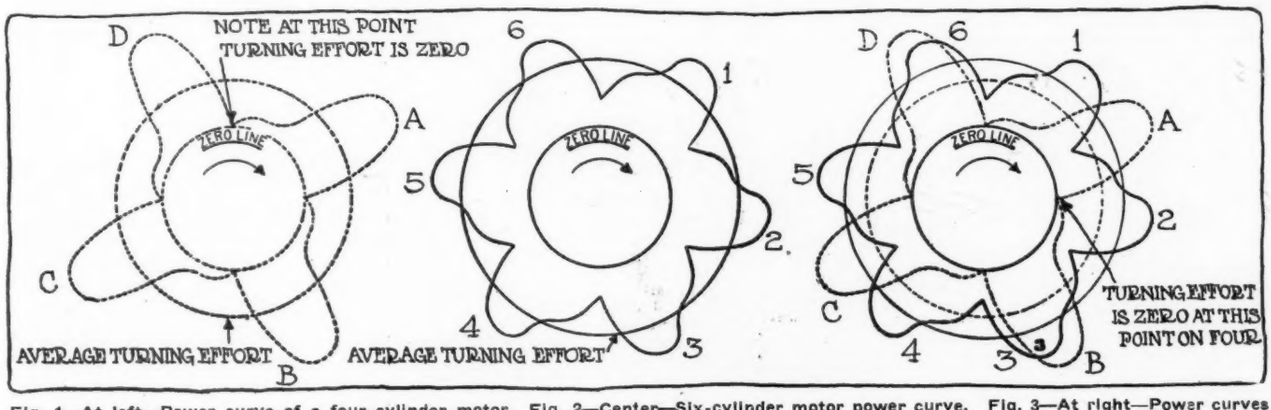
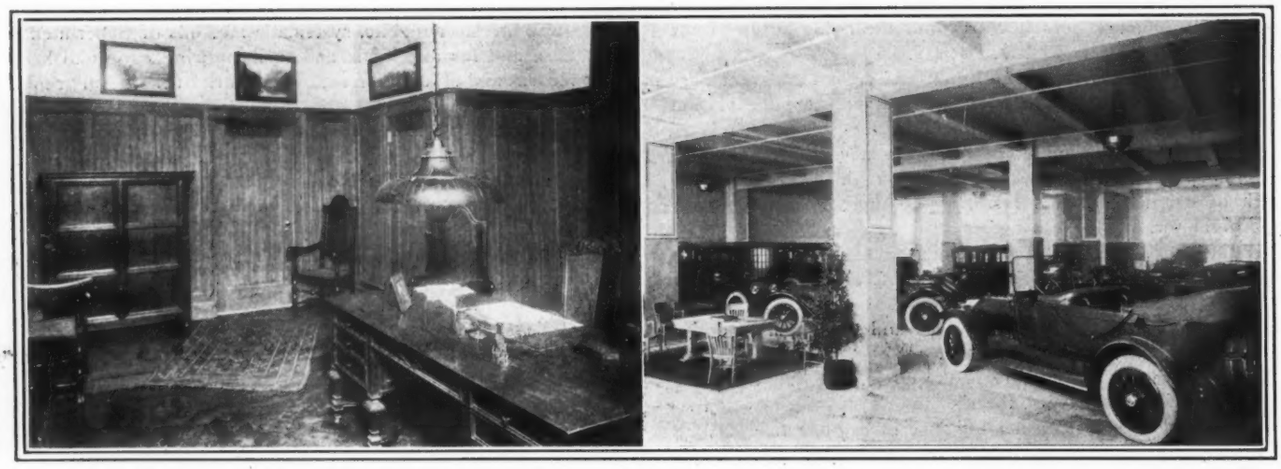


Fig. 1—At left—Power curve of a four-cylinder motor. Fig. 2—Center—Six-cylinder motor power curve. Fig. 3—At right—Power curves of four and six-cylinder motors combined for comparison



At the left is shown the manager's office at the new Locomobile service and sales building. At the right is a view of the salesroom

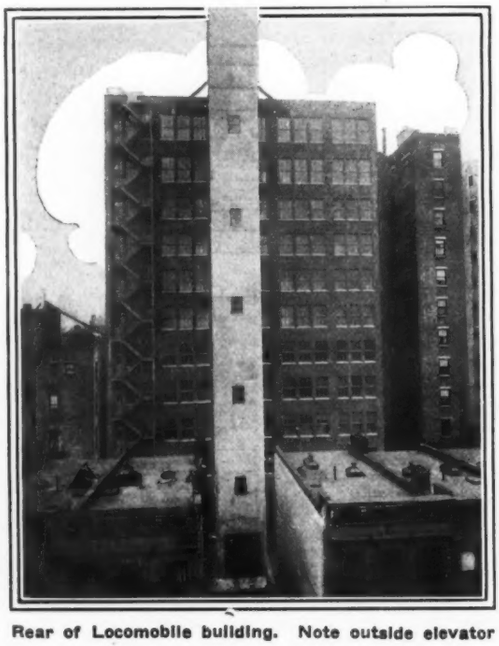
Service First Is Locomobile Password

Car Owners Considered Most Important in New Building—Outside Elevator and Inside Forge Are Features of Construction

SERVICE is the keystone and efficiency and economy are the foundation of the new service building recently opened in New York City by the Locomobile Co. of America on Sixty-first street near Broadway. This structure marks a long step forward in the progress of the service movement by the manufacturers of automobiles in the United States. The significant feature and one which strikes the holder as most characteristic is the plain, businesslike plan and finish of the entire building. John F. Plummer, manager of the New York branch, states that the whole idea in this is to emphasize the fact which few people seem to have realized that the automobile industry must be henceforward conducted along strictly business lines, just like any other well established and stable industry. Service to the owner is the most important feature of the business nowadays, according to Mr. Plummer, for the satisfied customer generally means a repeat order, and, quite as generally, new orders. This idea of considering the car owner first of all is carried out throughout the entire organization.

Room for Growth Provided

Eleven stories in height, the new service building covers a plot approximately 100 feet square fronting on Sixty-first street, 80 feet west of Broadway, and having a covered car entrance from Sixtieth street. All cars enter the building from the rear through this entrance and a man is always on duty there. The reason for erecting the building on a side street instead of on Broadway or Fifth avenue is plain business economy. The same motive combined with foresight for future development, caused the company to erect an eleven-story building although six or seven give ample space at present, leaving four or five for renting purposes. Two floors are already taken. From these floors the company will derive a comfortable income until such time as it will find it necessary to use the additional space for its own growth.



Rear of Locomobile building. Note outside elevator

The main feature of the building from a constructional point of view is the fact that the freight elevator is entirely outside the building, a special shaft being erected for it at the rear. This may be seen in the accompanying illustration which also shows the manner in which all cars entering the building must pass over the elevator.

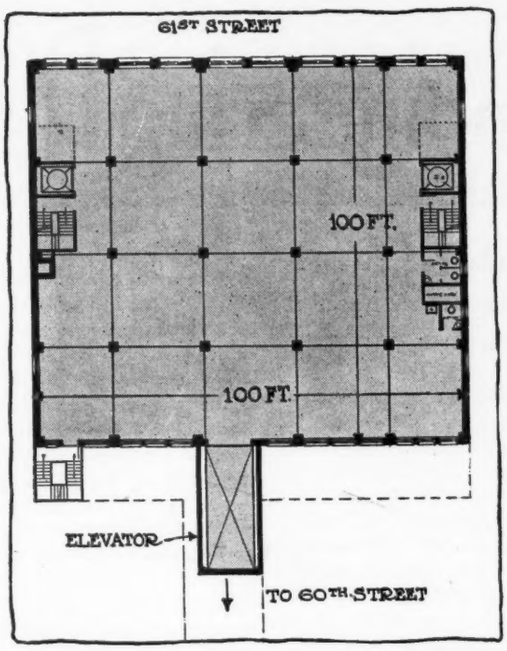
The elevator itself is one of the largest in the world, having a capacity of 16,000 pounds, a car length of 30 feet, a width of 10½ feet, and two speeds, 75 feet a minute on high and 40 feet per minute with extreme load. This elevator can carry two touring cars at a time. Mr. Plummer considers this elevator to be one of the most sensible and economical constructions ever applied to an automobile service plant. Not only does this outside arrangement save the same amount of space inside the building, but it also saves all the space which is usually required for maneuvering cars in order to get them on the elevator. This is a tremendous advantage. Another feature of this construction is the ease with which cars may be loaded onto a floor or taken off it, it never being necessary to move more than two machines to get a car to the elevator, no matter how closely the floor may be packed.

Mr. Plummer and the other officers of the company did not see the sense or economy of separating salesroom and service station as is so often done. They also wish to dignify the service

department as being most important of all. In accordance with these ideas the first floor of the building is given over to the sales room, manager's office and a conference room. The simple but artistic manner in which this floor is finished and the taste displayed in the furnishing of the conference room and manager's office is shown.

Service Department

The entire second floor is given over to the service department. An excellent idea of the way in which this is laid out may be gained from the illustration at the bottom of this page. Separated by a broad aisle are the two divisions of the department. At the front is a counter over which the car owner can transact all business with the company without moving from the spot. At the right is the office of the cashier and at the left that of the mechanical superintendent, thus doing away with the inefficient running back and forth between widely-separated offices. Across the aisle, screened off by wire grating, is the purchase department and the parts section, containing row upon row of shelves, boxes and bins for all parts of Locomobiles of every model and description. At the rear, in front of the elevator, is a wide space which permits of rapid loading and unloading of shipments of parts and other heavy materials directly into the stockroom. On this floor is stationed a "courtesy" man whose duty it is to act as a sort of floor-walker and to see that every customer, whether owner or chauffeur, is given prompt and satisfactory attention. The paramount idea at the Locomobile building is always Service First.



Plan view of the new Locomobile building. Note rear car entrance and outside elevator shaft

The service is in the hands of a service manager, who acts in a supervising capacity and a staff of inspectors. These inspectors are taught that they are the immediate representatives of the car owner and their task is to look out for his interests. Mr. Plummer states that the chief cause of trouble and inefficiency in service work is the failure to take the customers' orders intelligently, the idea being that the workman in the shop, who handles hundreds of cars in a year, does not know each car as the owner or chauffeur knows it and, consequently, cannot give it adequate attention. The function of the service inspector is to bridge over this gulf between the car owner or chauffeur and the workman in the shop so that when a piece of repair work is completed it is to the customer's satisfaction. Each inspector individually looks after each repair job which comes into his hands and follows it through the shop. Then, when the men have done the work, the inspector tests the car to see if everything is in good condition.

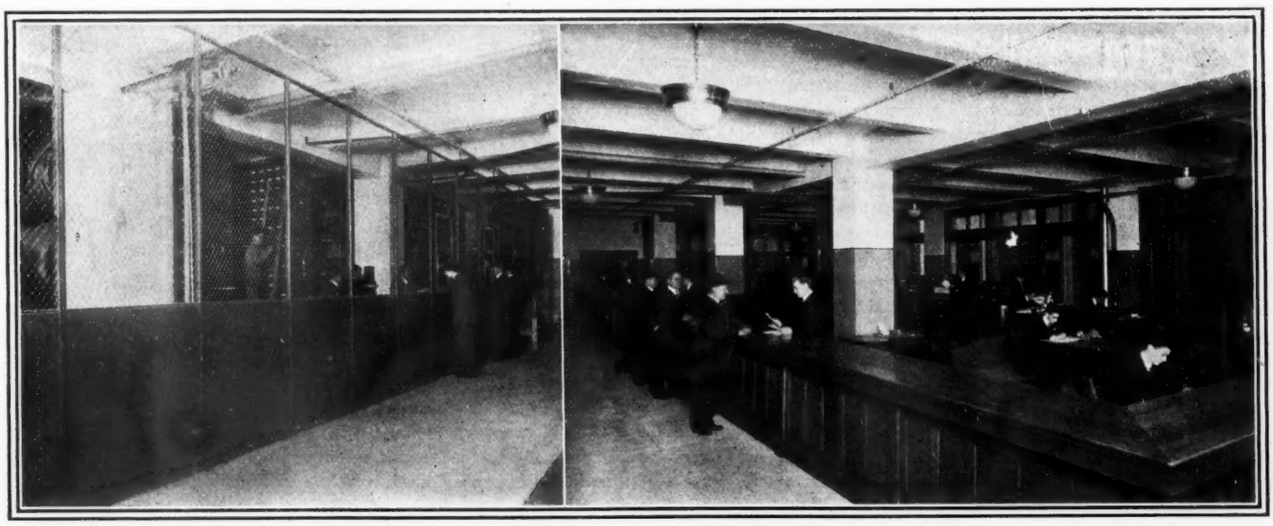
Estimates on All Repair Work

The service department gives estimates on every piece of repair work, This is an excellent system, as under it the owner knows exactly what the work will cost before it is begun. Also, when a chauffeur comes into the service plant and orders repair work done the estimate is immediately sent to the owner, who therefore knows that the work is being done and how much it will cost. When the bill is sent at the end of the month a copy of the estimate accompanies it and the bill is always for exactly the same amount as the estimate. By the use of such businesslike methods as these there is no possibility of disagreeable arguments between owners and service department.

The third floor of the new building is the used car department where the company keeps the cars turned in by customers who wish the company to act as their agent in disposing of them. All the company's used car business is transacted on this floor which also contains a special department for the delivery of new cars.

The top three floors are used for shop purposes. The basement is the receiving floor and is used to house the demonstrating cars, storage, etc.

The building is constructed with a view to low insurance rates, no gasoline whatever being stored inside, a buried tank in the alleyway serving for this. On the eleventh floor there is an unusual feature—a forge where it is possible to bring the car being repaired into the forge room. This is rendered permissible under the fire regulations by having a large hole in the roof. The building has two passenger elevators.



View down the aisle of the Locomobile service department which occupies the entire second floor in the new building. The service counter is at the right and the parts stockroom at the left

The Engineering Digest

Wave Formations on Roads and Streets Caused by Hammering Motor Wheels According to Crompton

A STIRRING THEORY BUT NOT EASILY ACCEPTED

EVER since the seventies R. E. B. Crompton, now Col. R. E. B. Crompton, C. B., has brought into frequent evidence a rare faculty for becoming an expert on every subject, civil or military, in which he took an interest and of becoming interested in many developments in which the need for expert advice was obvious. Motor and automobile design, motor bicycles, aviation, motor trucks and road trains, road rollers and road construction all come within the range of his versatile and sometimes radical constructive conceptions, which are always set forth with a considerable array of substantial facts to support them and backed by the courage of his convictions pro tem. It is further to his credit that he can change his convictions, or at least drop them, when due reason for doing so is shown. As he is still heard with respectful attention in 1914, by engineers and specialists, it stands to reason that his discourses and propositions usually must have had in them those qualities which arouse thought and make for action in others, whether fully defensible or not.

These lines may be necessary to explain to American readers why a recent lecture by Col. Crompton before the British Institution of Mechanical Engineers has attracted wide attention. It was entitled "Mechanical Engineering Aspects of Road Construction," so as to justify its delivery before mechanical engineers and emphasize the view that collaboration is required between those who build the traffic vehicles and those who build the roads, before the best results can be expected. As the traffic is now largely composed of motor vehicles and these introduce a number of new factors which are best known to their builders and yet relate in their effects to road wear and road destruction, and as the road may in fact be considered as "the other half of the automobile," as important for the economy and utility of motor vehicles as the mechanical construction of the vehicles themselves, much would be gained if motor vehicle engineers would devote as much research to an investigation of the mechanical factors entering in road construction and maintenance as road builders are compelled to give in the matter of resisting the deteriorating effects of the rapid and heavy new members of the traffic.

The main theme of the paper, however, dealt with the deformation of road surfaces which in some instances sets in shortly after the road has been built and is plainly visible as an almost regular succession of ridges and depressions known as road waves, and with the means for avoiding them in future construction. In *The Engineer* of December 26, Col. Crompton's remarks and theories on these points are summarized and in subsequent issues of the same journal the paper is reprinted in full. The following is taken from these sources.

With modern fast traffic, he said, on roads tarred or otherwise rendered waterproof, unevenness of the surface did not result so much from the actual removal of material as from the formation of waves by the rhythmical percussive action of the wheels of fast self-propelled traffic. There was an actual transfer of material in the direction in which the traffic moves. With a newly made surface the angularity of the particles composing it resulted in the stones abrading one another under the rocking motion produced among them by the rolling action of the wheels. [A model was shown imitating this action.] When the stones became more or less rounded they could roll over one another and take up new positions, and it was found that in the end the larger stones were carried to the crests of the waves and the smaller particles to the troughs. The wave-forming action of old-fashioned traffic was practically zero because of the large diameter of wheels used and the heterogeneity of the classes of vehicles using the roads. Today wheel diameters were smaller, and the general harmonic characteristics of the vehicles closely resembled one another, so that the formation of the waves, once started, was intensified as time went on instead of being obliterated. Something other than the traffic itself was, however, required to start the waving in most cases, and he had traced this something to the ordinary two-axle road roller when used to roll the material in the direction of the traffic. The wave length produced depended upon the diameter of the roller wheels, the total weight, the distance between the axles, and to some extent upon the speed. The roller pushed the material forward until the resistance to forward movement rose to a certain limit, whereafter the roller mounted over the accumulation in front of it. The waves produced in this manner undoubtedly served as a starting point for the waves of shorter period eventually formed by the traffic. In view of these facts he had designed, and Messrs. Barford and Perkins had constructed, an internal-combustion motor road roller having three axles unequally spaced. The central axle was spring-mounted, so that its roller could move down slightly below the level of the other two. This roller was illustrated and its mode of action described in detail.

After further discussing the best means for building roads which will resist the tendency to wave formation and showing the machinery presumably best adapted for this purpose—being that used with the American system of covering a concrete foundation with an artificial sheet asphalt formed from a sand aggregate held together by a bituminous binder—Col. Crompton showed as an example of wave formation the diagram reproduced in Fig. 1 giving a longitudinal section of a portion of the London-Folkestone tar-macadam road together with tire prints left by vehicles passing over it. Taking the width of the prints as indicating the pressure between tire and road, it was characteristic that the maximum pressure was in all cases reached just before the crest of a wave. The imprints showed also that the wheels frequently left the ground entirely and it could be inferred that the wheels of modern vehicles pass over the road at a speed sufficient to transform the smooth rolling of the wheels into a bounding and pulsating motion.

Other Experts Make Comment.

Among the remarks made in the general discussion following the reading of the paper, Crompton's theory was in part confirmed and in part controverted. It was mentioned that roads constructed from set-makers' chips, up to 6 inches long and flat, showed no wear or deformation after 11 years of use. Excellent results were also obtained by using a bituminous binder with furnace slag, which is flat. The cubical stone usually employed was probably the least satisfactory, with regard to wave formation, because it was nearest to the round shape and therefore more readily displaced by pressure. On some of the roads carrying much traffic of the delivery-van type out of London, nine-tenths of the deformation was to be found on the loaded out-

journey side of the road, Mr. Dryland, a well-known surveyor, observed.

The question was asked whether the waves moved in the direction of the traffic, and thus in opposite directions on the opposite sides of a road, and whether the crest of the waves finally curled over and broke down under the traffic. It was answered that the waves did advance in the direction of traffic, but data were insufficient on the other points. Why did a wood block pavement show waves just like those in tar-macadam and asphalt? No answer was recorded. W. W. Beaumont vigorously opposed the idea that there was any periodic hammering in the action of motor vehicle wheels, but admitted that road rollers might start waves; in fact, he himself had first called attention to this fact. [Mr. Beaumont is an accepted authority, one of the oldest, on the data of automobile construction and kindred subjects.] Crompton replied that the harmonic or periodic action could be proved. He had repeatedly noticed that any projecting hump in the surface could start a ripple, which would travel along in the direction of the traffic and soon developed into a wave.

In an article in *The Autocar* of January 10, a civil engineer takes exception to the theory of harmonic hammering of the wheels, showing that there can be no mechanical reason for such action at any speed, but that irregular hammering may take place due to the rebounding of springs after the wheels have struck a hump or a hollow. As a remedy, rebound checks might be recommendable. He also points out that when wood pavement develops waves the hollows or troughs represent actual wear and not displacement of material and that at turns of the road the hollows are only on the inside curve and at irregular intervals, though always farthest apart at the entrance to the curve.

Digest Editor Suggests a Variant Theory

[Throughout the discourse and the discussion here summarized the observed fact which has apparently most influenced Col. Crompton in the formulation of his theory of periodic wheel hammering remains uncontradicted. This is the fact that the waves in bituminous road surfaces, where they are formed at all, as well as in certain styles of waterprooved wood pavements, show a conspicuous regularity in lengths and some regularity in the depths of the hollows. If it is difficult or costly to avoid these wave formations, and all which they imply of additional wear and tear of vehicles, it is important to find an explanation for this regularity. It seems to indicate a periodicity of some kind and, as Col. Crompton's periodic pulsations or wheel impacts seem too mystic for acceptance, in so much more as no such action could take place without finding expression in the action of the vehicle springs and being noticed by drivers and passengers, another periodic factor may be suggested as presumably the true one and also one which renders it superfluous to fall back upon the faulty action of road rollers as the first cause.

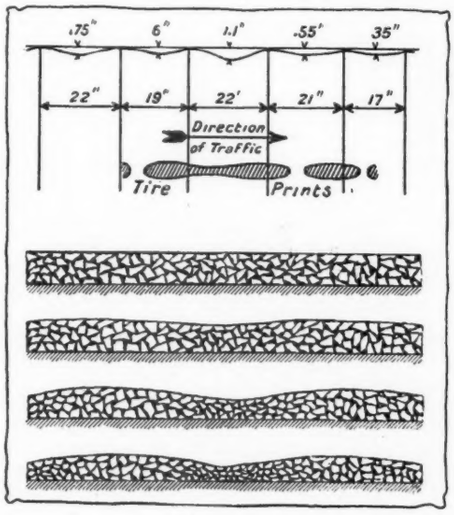


Fig. 1—Wave formation on road near London with imprints of vehicle tires, indicating why traffic fails to smooth the waves

Fig. 2—Diagram based on many examinations, showing that large stones are pushed toward crests of waves by traffic or other forces.

This periodic factor is nothing more wonderful than the regular succession of day and night with the accompanying changes from a relatively high to a relatively low temperature and the expansions and contractions which are inseparable from changes of temperature where the question is of materials unified by a binder capable of displacement but not subject to evaporation or reduction of volume by mechanical compression.

It may be assumed that any given road surfacing will set up a certain resistance against the horizontal displacement of its materials, will have a certain coefficient of expansion under changes of temperature and represents a certain weight to be raised and cohesion to be overcome when the continuity of the surfacing in the direction of the road renders it impossible for any expansion to take place in any other manner than by transforming the straightlined surface into a curved one which will make room for the expansion. It seems evident that these factors, varying as they do for different road constructions, will determine the length of the waves in each case with as much regularity as the construction represents; also that the wave length will be a constant for each construction and will not be much influenced by either the range of the variations of temperature or the weight or speed of the vehicles passing over the road.

That at turns it is the inside which becomes wavy would under this theory be explained through the possibility for expansion without wave formation along the outside curve; the same factor which explains that no waves are formed crosswise of the road where expansion can take place, partly by reason of the small extension and partly because roads are formed with a crown which allows some degree of equally distributed expansion of the road materials.

The aggravating effect which traffic must have upon the wave formation, on this theory—to raise the crests and deepen the troughs—may be explained by the tendency which the incipient wave formation must have to loosen the crest of the wave from its foundation, thereby making room into which materials in the surfacing below the crest can be shoved without too great resistance when the wheels of the traffic press against them, pushing them forward, and it seems that elastic tires might perhaps have a stronger effect in this action than iron tires, since their elasticity in conjunction with the traction effort can take the form of a horizontal push while the pressure of an iron tire is always more nearly vertical.

A number of inferences might apparently be drawn from this theory not entirely concording with those presented by Col. Crompton. But his conclusions in favor of sheet asphalt, composed of a sand aggregate with about 10 per cent. of lime or cement and only 12 per cent. of bituminous binder, all of it on a concrete or macadam foundation, would probably continue to hold good where the first cost is a secondary consideration, as this material is naturally more capable of absorbing expansion within itself than a tarred macadam or any other construction in which stone abuts against stone with a plastic but incompressible binder material filling the irregular interstices. If slag or flat stone chips are used—also slate or oyster shells, as in some places in the United States—the binder material may apparently have a chance to expand, crosswise of the road if not lengthwise, without compelling the displacement of the stone, as the channels in which the binder is lodged must be practically continuous, and this may explain the comparative success accomplished with tarred-slag roads, especially as slag probably has a much smaller coefficient of expansion than trap.—Ed.]

Among 469 attachments to prevent mud-splashing from vehicle wheels the municipality of Paris found 10 promising ones but none fully effective. The prefect of police was nevertheless requested to make their use obligatory, as several of the devices were found fairly useful, as well as durable and cheap.

New French Two-Cycle Motor Designed for Speed and Responsiveness

SINCE the two-cycle type of motor has almost passed out of existence as an automobile motor in the United States, while still continuing in favor for boats, the continued efforts which are made in Europe for having this type ranked among other valveless motors and getting it accepted in the market as suitable for automobile work have entered among the subjects to be watched with redoubled interest from afar, lest a favorable development of two-cycle efficiency eventually take those by surprise who at present have consigned this type, mentally, to the scrapheap of the experimental department. On this principle an account was given last week of the Lutin two-cycle motor in which an improvement tending toward fuel economy and reliability at high speed is the salient feature. Another two-cycle motor which was shown at the recent Paris salon is the Cornilleau designed by Le Bihan. Its arrangement is represented in three sectional views in Fig. 3. It is described substantially as follows:

The absence of all valves and rotary or sliding organs for distributing the explosive charge is the feature distinguishing it from other modern two-cycle motors. The movable elements are the two-story pistons, the connecting-rods and the crankshaft only. The pistons are made of aluminum and the motor can be operated at a speed of 3,000 revolutions per minute without inconvenience or vibration; at the lower speeds it is very responsive to acceleration. As shown in the vertical cross-section, an admission port *l* is formed upon the piston itself, being a channel leading from the space around the lower portion of the piston to the admission conduit *p* formed between the two cylinders. A deflector *f* is carried on the top of each piston as usual. The cylinder dimensions are 75 millimeters bore by 100 millimeters stroke, and the diameter of the pumping cylinder, in which the lower portion of each piston works, is 110 millimeters, this giving a capacity only slightly in excess of that of the cylinder or that of the intermediate admission chamber *i*, where the fresh gases are therefore compressed in only slight degree. All the interior conduits and chambers are cast with the cylinders and contiguous, more or less, to the water jackets.

The admission ports *bb'*—see cross-section AA—opens into the chambers *ii'* which are separated by a partition of S-section. Two vertical channels *mm'* make each of these chambers communicate with two similar chambers *nn'* below them—see cross-section BB—which are also separated by an S-partition running oppositely to the partition above it. In this manner chamber *i* communicates through *m* with *n'*, and *i'* communicates through *m'* with *n*. The pumping cylinders are thus coupled crosswise with the combustion cylinders as in most other modern two-cycle motors; in fact, in the top of the pump cylinders *ee* the ports *j* and *j'* lead to the chamber immediately above from which the crosswise distribution takes place as already explained.

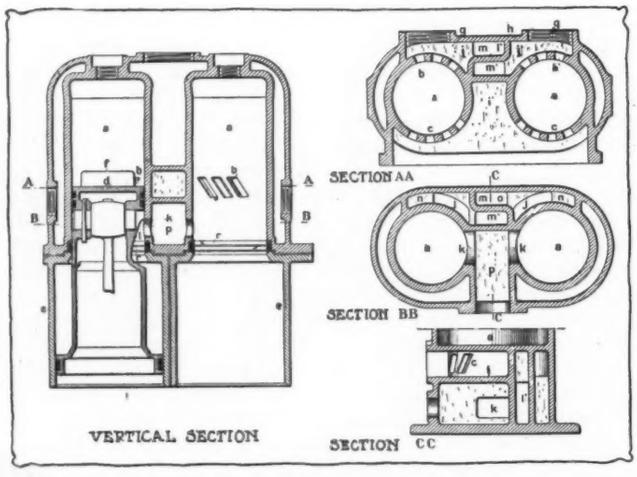


Fig. 3—Construction of Le Bihan's two-cycle motor—No moving distribution organs except the piston

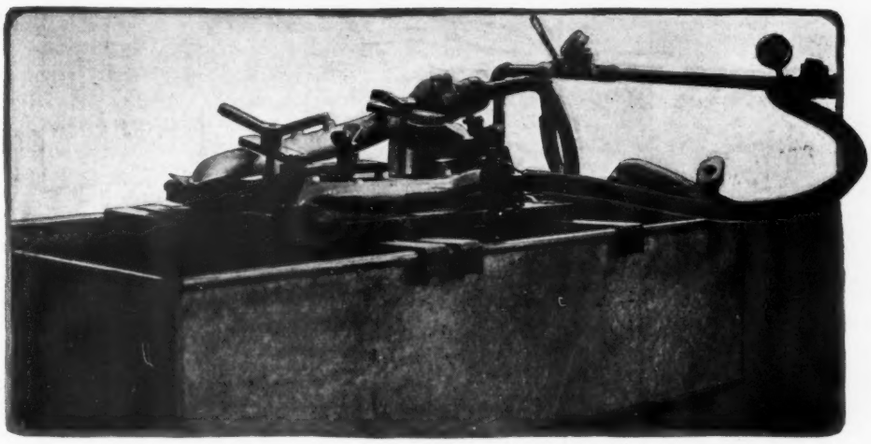
The suction to the carbureter takes effect through the channel *p* into which open the two ports *k*, one from each cylinder. A double piston ring in the cylinder wall closes the pump cylinder at its top and other piston rings are employed upon the pistons themselves in the usual manner. In the position shown in the illustration the piston to the left is near the end of its stroke; the burnt gases are escaping by the exhaust ports *cc'* chased by the fresh gas which at this moment has been compressed by the pump to the right and forced into the chambers *n'i*, thereafter entering the cylinder when the admission ports *b* are uncovered. An appreciable interval comes between the opening of the exhaust and the admission, so as to have the cylinder fill up well. The exhaust ports are calculated for an exhaust speed of 160 meters per second at a motor speed of 1,800 revolutions per minute. During the explosion the piston to the left uncovers the port *k* and enables the pump to draw in a fresh charge but not till a considerable depression has been produced in this pump cylinder. When *k* is opened, the suction taking place to the carbureter through *p* is therefore very strong, at once imparting a high velocity to the incoming charge resulting in a complete filling of the pump cylinder. Then the admission ports to the cylinder are thrown wide open but are rapidly closed when the piston ascends.

When the left piston rises that to the right descends and the left side pump now sends its charge through ports *k* partly to the conduit *p* and partly to the intermediate admission chamber *i*. The movement of gases taking place through the ports *k* from the moment when the piston movement is reversed has the effect of neutralizing the water-hammer action which occurs in a column of gas when its direction of movement is reversed, but this regulating-action ceases progressively in the measure as the piston ascends through the mere fact that the port *k* is gradually reduced in effective area by the rising edge of the channel upon the piston. The amount of gas which can pass through *k* by the pump action is limited by several factors. In the first place, the resistance to the movement of the gas through the large orifice *j* and into the intermediate chamber *i* is smallest at the beginning of the piston displacement and, secondly, the varying contours and areas of port *k* produce in themselves a considerable strangling effect. When *k* is completely closed by the rising piston the charging is thus completed through the port *j* alone and gas is compressed in the intermediate spaces, *p* and *i*, as the admission ports *b'* in the cylinder to the right are not yet uncovered by the piston on the same side. But toward the end of the downstroke the ports *b'* are uncovered and the explosive mixture is admitted to the cylinder, and the pump of the other cylinder completes the filling by finishing its upstroke.

It is thus seen that at the beginning of the admission there is a sudden injection by reason of the expansion of the gas previously compressed, which chases the exhaust gas out and sweeps the cylinder, and then the admission is supplemented by direct action of the pump.

Contrary to what takes place in a four-cycle motor, where the depression caused by the piston is weak at the beginning of its suction stroke, when the piston speed is small, the Le Bihan motor operates with a very strong suction to the carbureter at the moment when the admission port to each pump cylinder is opened, and to this peculiarity is ascribed the rapid accelerations of which the motor is capable at any speed between 800 and 2,000 revolutions per minute. Between these limits, the alimentation and the exhaust of the new motor are both operated with equal efficiency, regardless of intervening speed variations. It was exhibited at the show mounted in a small automobile which was offered at a low price.—From description by d'About in *La Vie Automobile*, January 17.

No hydraulic transmission has yet become regular equipment for any make of automobile or motor truck in Europe. Variable viscosity of oil constitutes an objection to the system, so far.



Testing Manifolds By Hydraulic Pressure

Water manifolds undergoing hydraulic test at the Overland factory. The water used for this purpose is pumped to a pressure of 100 pounds per square inch

AN evidence of the care exercised in manufacturing even the simplest parts of an automobile is given in the above illustration taken in the plant of the Willys-Overland Co., of Toledo, O. The photograph shows the method of testing the aluminum water manifolds that connect the cylinder jackets with the radiator in the cooling system of the motor.

Before assembly in the motor each of these manifolds is securely fastened to a level surface over a tank, as shown, on which a strip of rubber has been placed to act as a gasket. The ends are then connected by a hose to a big water-main through which water is pumped at a pressure of 100 pounds to the square inch. When the connection is complete, a valve is opened which allows the water to rush into the manifold. Water under this pressure will seek out the slightest hole or flow in any material, instantly revealing whether the part is perfect.

Engineers say that cold water under pressure will find a smaller outlet and provide a much more severe test than will steam or any other material, liquid or vapor. It is for this reason that locomotive, steamship and stationary boilers, intended to carry 100 to 250 pounds steam pressure, are always given the cold water test in the plants in which they are manufactured.

Balancing Armatures of Electric Starter

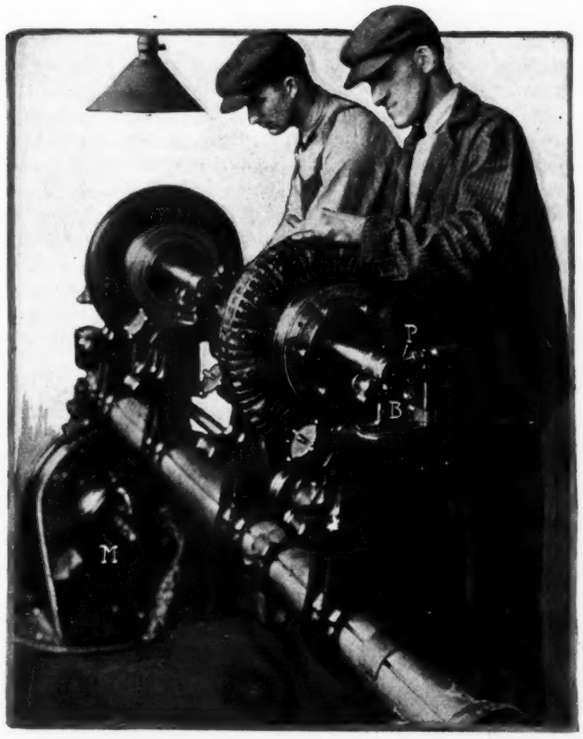
SINCE the armature of the U. S. L. cranking motor takes the place of the flywheel of the engine and continually runs as such, whether it is in operation electrically or not, it is necessary to have it balanced with the same care and accuracy that is usually devoted to crankshaft balance.

The laminations, commutator, spider and all the mechanical parts of the armature are machined on the shaft so that only small inaccuracies can creep in from these sources. But the electrical winding is another matter. It is practically impossible to insert copper coils in the slots at a comparatively great radial distance from the shaft without setting up an inequality of balance.

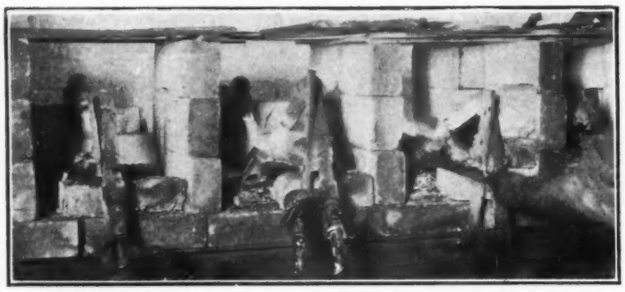
To correct this in the U. S. L. factory every armature is tested after winding and any lack of balance restored on the machine shown in the accompanying illustration. It will be seen that this machine is capable of dealing with two armatures at a time.

This balancer is of the Norton type as used for crankshaft balancing. It consists essentially of a pair of flexible supports or bearings to take the shaft of the rotating member to be tested and a means of imparting motion to it. Each of these bearings B, consists of four rollers at the top of a flexibly mounted spindle. Directly in front is situated a bracket in which a screw pointer P can be slowly moved until it touches the spinning shaft.

In testing, the armature is placed in position with a belt from the counter shaft immediately below passing around the armature shaft. Then on starting up the motor M a very high speed is given to the armature which, as a rotating mass, at once finds its own center of rotation, whether that agrees with the shaft center or not. In the latter case the shaft is running with a slight degree of eccentricity and this is noted by approaching the pointer P, which records the high points on colored paste previously applied to that part of the shaft. The machine is then stopped and pieces of lead driven into holes drilled in the armature on the light side, until perfect balance is obtained.



Machine used to obtain perfect balance of the armatures of the U. S. L. combined starting motor and lighting generator. One armature is shown spinning to determine the inequality of balance, and in the other this is being corrected by the insertion of lead plugs on the light side of the armature



The Rostrum

Engineer Defends Slow-Speed American Motors

EDITOR THE AUTOMOBILE:—In glancing over your issue of January 22 I had occasion to notice Mr. McFarland's comment on American motor car design as compared to European practice.

It occurs to me that there are a great many people driving cars in this country who are laboring under an illusion regarding the desirability of cars as constructed abroad. American practice is the direct result of American conditions—legislative and otherwise.

European users are, with very few exceptions, blessed with extremely fine roads and freedom from persecution for the violation of the speed laws. This even applies in city driving. Under these conditions it is possible to run a motor car at reasonably high speeds 75 per cent. of the time. This, together with the cost of fuel—which in England is about 35 cents per gallon and in the city of Paris about 60 cents—has a tendency to develop a high-speed, small-bore engine.

To obtain conditions that would give Mr. McFarland an idea of what a car of this character would be like, would be to assume a car using a Ford engine in a chassis weighing between 1,600 to 1,800, with the body weight and full equipment bringing the total weight up to about 2,600 to 2,800, equipped with a four-speed transmission and geared from 3.5 to 3.75 to 1. It will readily be seen that this engine will have to have every advantage in order to negotiate road conditions as we find them in this country; it will call for shifting gears on imperceptible grades; ability to hold a grade on direct drive without getting a disagreeable rattling in the cylinders that is generally noticeable when an engine is working under full capacity; lack of ability to carry ignition advance; and, last but not least, you will find your fuel consumption, while being somewhat lower than with the standard American practice, will not be low enough to compensate for the discomfort involved in driving an under-engined car.

The writer does not wish to go on record as criticising European practice, but merely wishes to draw attention to the parallel between European and American products. You will find the fuel consumption in the British Isles runs about 18 miles per gallon on the average, and this is considered good. This is with the Imperial gallon, which is a fifth larger than the American gallon. On the Continent you will find the average somewhat higher, and I have known of cases where they claim 30 miles per gallon. The carbureters in these instances are so set that they are very sensitive and are not capable of being opened suddenly for acceleration. These cars are geared as high as 2.4 to 1, and are capable of very high road speeds, but they have very poor throttling properties. Inasmuch as a great percentage of American cars are used in city and town work, cars of this description would be wholly impossible.

Another thing we do not want to overlook is the climatic conditions governing the selection and practice in carburetion. On the whole, the temperature range in the British Isles and on the Continent is scarcely half of what we have to contend with on this side of the Atlantic. This makes considerable difference in the fineness with which we can set our mixture.

If the American driving public would be satisfied with the same behavior or performance of the motor as is standard on the other side of the Atlantic, we would undoubtedly be able to run our fuel economy even beyond that which is being obtained on the other side. Up-to-date, our experience has been that when such things are attempted the design is condemned as being under-engined and is a very poor specimen of an automobile. I predict we will have to go through a campaign of education on this score before any great strides can be made in this direction.

It may be a matter of interest to realize that the famous Continental and British 15-horsepower cars have grown to 20-horsepower cars in the course of the last year. This indicates that the smaller engine, even last year, was not as satisfactory as it should have been. To obtain the horsepower of cars rated in this manner it is fair to assume that the actual horsepower is in the neighborhood of twice, or slightly less, than two times the listed rating. This, you will see, does not come under what the average man would call a small engine.

Detroit, Mich. C. G. HINKLEY.

Thinks Cyclecar Design Should Follow Big Car Practice

Editor THE AUTOMOBILE:—Your recent articles upon the cyclecar have awakened widespread interest not only among people who have never been able to own a car on account of its high cost and expensive upkeep, but also among people who have owned and driven high-grade cars for years. The articles written by Messrs. Stout and Mercer which appeared in your columns are highly interesting and instructive, but are apparently written purely from the manufacturer's standpoint and from some of their views I wish to dissent. For instance, Mr. Stout asserts that the best engineering practice demands a long belt drive and tandem seating. I doubt if all the engineers in the world can make the public accept either of these forms of drive and seating. I have invariably heard nothing but adverse comment upon both.

My idea of a cyclecar would be as follows: It should have 36-inch tread, 100-inch wheelbase, staggered seats which can easily be put into that size tread and make a graceful body, slightly bulged amidships and giving a streamline effect. Other features would include a friction transmission and final drive by double-inclosed chains to the rear wheels, gasoline tank in

the cowl, a sloping hood after the Renault style, and an air-cooled engine of either two or four cylinders, preferably the latter, inside the hood. Ignition should be by magneto and storage battery with the added luxury of a small dynamo to furnish electric light to one large headlight attached to the front axle and moving with it, two small sidelights built in metal tubes into the cowl and a rear light. The clearance of the car should be 6 or 8 inches.

Friction transmission and double chain drive to the rear wheels is absolutely reliable, and is much more sightly than a long belt extending nearly the whole length of the car, catching all the mud on the road and requiring constant cleaning in addition to the continuous changes in the length of the belt due to wet or dry weather.

I am driving a 90 horsepower roadster and the lines of the cyclecar I have described would almost coincide in minature with my big car. A set of tires costs me $200, and other expenses are in proportion. I would gladly buy a cyclecar of the character I have described, and would probably use it four times as often as I do my big car. My big car has a clearance of only 6 inches and I have never yet found a road over which it could not be driven.

There appears to be a perfect medley of designs, transmissions, treads and final drives in your descriptions of various cyclecars. The public has been educated for years to certain forms which have proven reliable and to which they are accustomed. Why spring new and freakish features upon them when standard designs are at hand?

Stamped aluminum bodies should be used and not tin. An examination of several types of cyclecars discloses a body made of flimsy material which is bound to rattle and will not stand even moderate usage.

Boston, Mass. H. M. F.

The Use of Alcohol in Acetylene Generators

Editor THE AUTOMOBILE:—In using carbide for light, what effect will it have on the light to use enough alcohol in the water to prevent freezing?

Oakdale, Pa. W. J. CASSIDY.

—The addition of alcohol to the water used in an acetylene generator will have no effect on the gas generation, but it will of course dilute the water so that more of the mixture will be needed than would water alone, and therefore with alcohol present more water will need to be fed to the carbide.

It would be cheaper, and just as satisfactory, in this case, to use a solution of common salt or calcium chloride; either of these will lower the freezing point of the water depending on how much salt is put in and will not interfere with the generation of the gas nor have a corrosive action on the metal, which is undoubtedly brass.

Adjusting Steering Gear on Buick

Editor THE AUTOMOBILE:—1—I would like directions for taking up the play in the steering gear of a Buick model 10.

2—This machine is still giving good satisfaction and I would like to make some changes in the body this winter. It is fitted with rumble seats and I would like to convert the body into a semi-enclosed raceabout type, as the machine has pretty good lines for this purpose.

I want to lower the front seat and put it about a foot back so as to give more leg room. Also would like to have tool box on rear, now occupied by rumble seats and would like to have large gasoline tank on the outside.

Any plans, specifications or hints that you can give me that will aid in converting the machine into a semi-torpedo roadster will be thoroughly appreciated.

Pleasantville, Pa. HARRY J. BOTSFORD.

—1—The adjustment of the Buick model 10 steering gear is illustrated in Fig. 1, and is accomplished by screwing down on the nut A. Care must be taken not to screw this nut up too tightly. It should be adjusted only until all the back lash has disappeared, and not enough to cause the steering gear to bind. Before this nut is moved, however, the locking set screw B and its lock nut should be loosened and of course after the adjustment is made they should be tightened again.

2—It should be easy to make over your car into a racy-looking runabout. As you suggest the seat should be placed practically on the floor with enough leg room to make this position comfortable for the occupants and you might fit low, wide side doors if an inclosed design is desired. The gasoline tank should be placed right behind the seats and should be preferably cylindrical in shape. Back of it the tool box or an auxiliary oil tank should be placed and the tires carried at the rear. The steering gear should be raked over several degrees, so as to correspond with the lower position of the seats.

The most important point in designing a body is to make the lines consistent; this does not necessarily mean that the streamline effect must be adopted, but the lines must harmonize. If you follow out this idea you will have no trouble in constructing a good looking body.

Selection of Gear Ratio Is Arbitrary

Editor THE AUTOMOBILE:—Kindly answer the following questions in the Rostrum of the Automobile: 1—What is the formula most generally used in determining gear ratio for direct drive in a motor car? 2—What is the formula for determining the size and length of the drive chains on a four-wheel drive truck? 3—What are the advantages and disadvantages of the movable magnet type of magneto as compared to the stationary magnet type? 4—What is the width of the face of the gears used in the sliding gear transmission of the 1914 Pierce Arrow cars? What is the diameter of the crankshaft in the various models?

St. Louis, Mo. E. H. K.

—1—There is no formula for determining the correct gear ratio on direct drive. This is something that is not easily figured out in a theoretical way, although it would be simple to work out a formula based on what has been found good in actual practice.

The selection of the gear ratio depends on several factors, and it is by considering their relative importance that the most satisfactory result is obtained. The speed of the motor being given, and the weight of the car and size of tires definitely known, the gear ratio depends on whether speed or hill-climbing ability is wanted, and each manufacturer has determined by trial what ratio is best suited to his car considering these points.

Small five-passenger cars with motors of about 3.75-inch bore and tire sizes varying from 32 to 34 inches generally use a gear ratio of about 4 to 1, although, of course, this figure varies, depending on the weight of the car, the maximum speed of the motor, and whether hill-climbing ability or speed is desired. Large seven-passenger machines with motors of about 5 inches bore and 38-inch wheels are geared about 3 to 1, but, of course, this varies in each particular case.

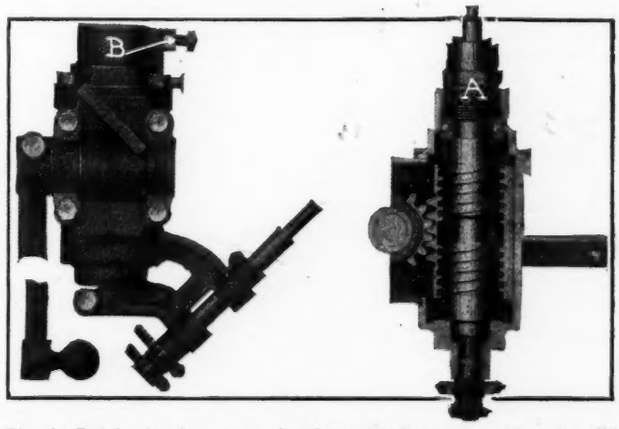


Fig. 1—Buick steering gear, showing adjusting nut at A and locking screw at B.

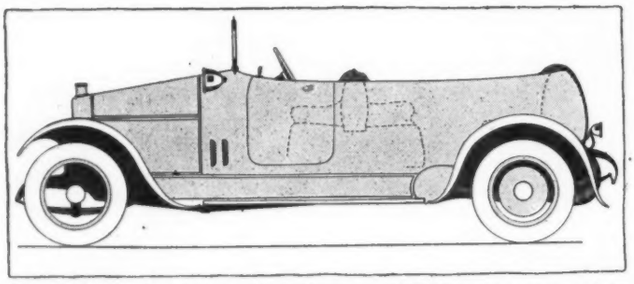


Fig. 3—Streamline body with Pullman seats that can be arranged to make a bed.

2—The same formula that applies to the design of chains for trucks driven through one pair of wheels applies to those driven through all four, although a four-wheel chain-drive truck must be considered as a novelty. Quite some difficulty and complication will probably be encountered in designing the driving mechanism so as to keep the sprockets in alignment and still allow for steering. Shaft drive is preferable.

In determining the length of drive chains, see Fig. 2, first find the size and pitch of chain required to transmit the power, and this can be learned by referring to a manufacturer's catalog.

Next, the number of teeth on the large and the small sprockets must be decided upon as well as the distance between the shaft centers and the height of one shaft above the other. The following formula for chain length can then be applied:

$$L = \frac{(90 + a)\,N\,P}{180} + \frac{(90 - a)\,n\,P}{180} + 2A$$

Where D = distance between centers in inches,
A = distance between limits of contact,
R = pitch radius of large sprocket,
r = pitch radius of small sprocket,
N = number of teeth on large sprocket,
n = number of teeth on small sprocket,
P = pitch of chain.

3—This question is not quite clear because there are two types of magnetos with movable magnets. One in which spark advance is obtained by rotating the whole magneto housing a limited amount about the armature shaft and another in which brushes are eliminated by employing magnets that rotate inside the armature winding which is stationary.

The advantage of advancing the spark by rotating the magneto is that a spark of exactly the same intensity is obtained throughout the range of movement. On the other hand, when spark advance is accomplished by moving the cam that separates the breaker points there is a tendency for a weaker spark to be generated when full advance is used. The explanation of this is simple. There is one position of the armature with reference to the pole pieces of the magnets at which a spark of maximum intensity is produced, and this is the point at which the magnetic lines of force are thickest. By advancing the spark by changing the position of the housing the relative position of the armature and the magnets when the spark occurs is unchanged and therefore the spark always has the same intensity. But when the other method is used the armature is in a weaker part of the magnetic field when the spark is produced, and therefore it is not so large. This objection, however, is quite theoretical and in actual practice it has been found that one system gives as good a spark as the other.

4—The width of face of the transmission gears used on the 1914 Pierce-Arrow car is as follows: 1 inch, 1⅛ and 1¼ for the 38, 48 and 66 horsepower models, respectively, and the crankshaft sizes are 1⅞, 2 and 2⅜ inches.

A New Type of Streamline Body

Editor THE AUTOMOBILE:—From time to time there has appeared in this journal articles in which car owners have asked for an automobile body suitable for sleeping purposes if so desired. Touring long distances has become quite popular in recent years, and since this is the true purpose of the automobile it is no more than right that the owner of a high-priced car should have a body suited to his tastes. How many of our high-priced cars are actually fit to give the owners absolute comfort when touring? Inasmuch as motor efficiency has been reached it is high time manufacturers were realizing the wants of their customers. For the last seven years the buying public has been offered the same thing in bodies, angular, box-like affairs upon which years of labor and tons of varnish have been wasted. Rush orders and cheapness will cause any good manufactory to cheapen its product, and to this may be attributed the slowness in the improvement of the automobile body. Not until this year have the makers begun to realize that to continue their product something new is needed. Since they have realized this now is the time to begin producing the real feature of a good motor car, a fine, luxurious body that is actually comfortable.

Fig. 3 gives a clear idea of how luxurious and comfortable an automobile can be made. This car has a six-passenger touring body made so that it can be converted into a sleeping car if so desired, yet never at any time disclosing its real purpose. Much time and expense are spent for good sleeping accommodations, and with the usual amount of bother much is taken out of the real pleasure of touring long distances.

It is a true streamline type. The lines begin at the rounded radiator and continue unbroken to the tire irons in the rear in one complete sweep. The driver sits on the left side with center control, the levers being placed a few inches into the cushions of his seat, so as to leave his compartment perfectly open. The instruments are on the left side of the dash and the foot rest is only large enough to accommodate the brake pedals so that they may be operated easily. The rest of the front part of the body is open. It must be borne in mind that a very wide body is used, and to accommodate it aprons are welded to the chassis frame on both sides as supports.

The main feature of this body is the true Pullman seat. It is built on the left side of the car and is a part of the body. The driver and one passenger sit with their backs to each other in absolute comfort. It has arm rests, and with its deep, tilted cushions is as comfortable as a morris chair. At the right of this seat is a roomy revolving upholstered chair with a back that folds backward completely. The rear seat is a wide, luxurious affair with a seat that can be raised or lowered and seats three passengers without crowding.

The back to the Pullman seat is removable. The end of this seat is of solid mahogany and built rigidly into the floor of the car. In the left side of the body and in the seat end are two brasslined slots made to receive the dovetail tenons of the removable back. This back is heavily and softly upholstered, its own weight keeping it in place when used as a back and it is removed by means of a strong leather strap which is part of the top of the cushion. The seat facing the rear seat is divided

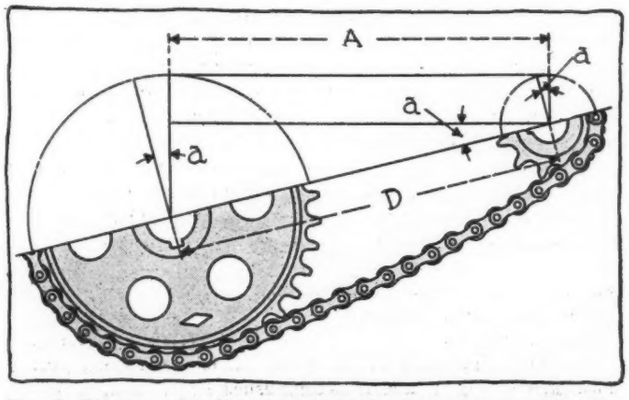


Fig. 2—Diagram showing measurements necessary to determine chain length.

into two cushions of the same thickness. The bottom one slides out into the tonneau on rubber rollers, and with the removable back fills up the space between the front and rear seats, making the left side of the car of the same level from the steering column to the rear seat. On the right side of the car the back of the revolving chair folds backward and is supported by two brass braces which lie flush with the floor of the car when not in use. It is plainly seen that the mattresses of two beds are made.

The entire interior is upholstered and trimmed in dull-finished mahogany. A thick cocoa mat is used as a floor covering, and when the top is up and the curtains down a comfortable little room is made. Portable electric lights, which are fastened to the top, give all the necessary light, and small electric fans keep the occupants cool in the summertime. The sleeping blankets are carried in trunks which are placed near the rear fenders. No pillows are needed because the cushion of the rear seat serves as a pillow when slightly raised.

Chicago, Ill. JULIAN F. BRASOR.

Caring for Leather Universal Joints

Editor THE AUTOMOBILE:—Now that leather transmission joints are coming into prominent use it might be well to point out the desirability of so caring for them that they will not harden and tend to break. It is a fact, as has been proven by many years of use of leather of this sort in belts, that pliability is a necessity to maximum life, and there is no reason why a transmission joint should ever fail if treated once in a while with a hot, penetrating, lubricating belt-dressing. This may be put on with a brush as indicated in the figure. The lubricant is absorbed by the leather, surrounds every fibre, and prevents internal grinding and wear.

This, also, is a good way to keep cyclecar belts soft, flexible, grippy, and waterproof.

New York City. W. F. S.

A Racy Roadster for Fords

Editor THE AUTOMOBILE:—1—Will you please tell me the most satisfactory way to clean covers that are rubber interlined?

2—Will you please publish a sketch showing how to make a racy looking roadster out of a Ford touring car?

Winnipeg, Can. G. G. YERRICK.

—1—First brush the covers thoroughly and then wash them with castile soap and luke-warm water.

2—There are many different designs you might follow in making a racy body for your Ford, one you might use is illustrated in Fig. 4. The seats should be placed on the floor and they should be moved back several inches to give sufficient leg room. The sides of the body should be made as low as possible and the doors made wide to give the effect of a low car.

If a sportier car is wanted you might do away with the doors altogether and just fit a pair of bucket seats to the chassis. In either case the appearance of the car will be added to by placing the gasoline tank and the tires in the rear.

Kerosene as a Carbon Remover

Editor THE AUTOMOBILE:—1—At the conclusion of each short journey while the motor is still warm, will the injection of about a teaspoonful of kerosene into each cylinder effectually prevent the deposit of carbon, assuming that the motor is in good condition, that high grade oil is used and the carbureter properly adjusted?

2—Will the regular use of and accumulation of kerosene in the oil reservoir be injurious to the motor or affect its power?

Brewton, Ala. E. M. BLACKSHER.

—1—The use of kerosene will not prevent the accumulation of carbon in the cylinders, but will minimize the amount. Its action is to dissolve the oil that holds the freshly deposited carbon to the cylinder walls and thus it is loosened and blown out the exhaust pipe the next time the motor is started. Kerosene is

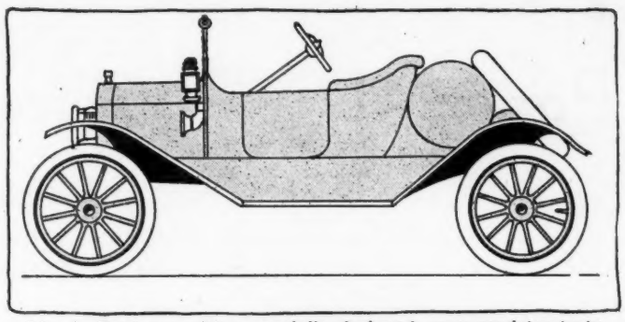


Fig. 4—Ford car with a specially designed, racy roadster body. Pistons and eccentric drive of Stewart four-cylinder pump

in no sense a solvent for carbon, but it will dissolve cylinder oil and so it tends to loosen up any carbon that collects in the cylinders.

2—A teaspoonful of kerosene in each cylinder a day will not cause any lubrication troubles because the amount is so small and also because the kerosene soaks into the carbon and very little, if any, makes its way down the cylinder walls to the crankcase.

Why Motor is Hard to Start

Editor THE AUTOMOBILE:—I am driving a National series V, using a Rayfield carbureter with a pressure-feed system. The car has always been hard to start and it has been necessary to crank it a great many times. It seems that it is unable to draw the gasoline from the carbureter to the cylinder as it always starts on the first or second turn of the crank after priming through the pet cocks. I have tried the Rayfield dash adjustment which is supposed to make starting easier but it seemed to have no effect in this case. Would it help matters to shorten the intake manifold thereby bringing the carbureter closer to the cylinders?

Newcastle, Wyo. JAY C. BAIRD.

—The use of a shorter intake manifold would not make starting any easier as this has practically nothing to do with the suction of the charge. It seems quite likely that your trouble is due to lack of pressure on the line. This may be caused by a leak somewhere or else the gauge is incorrect and so when the hand pump is operated preliminary to starting the gauge shows too high a pressure and therefore the pumping is not continued long enough to bring the pressure up to the required amount to cause gasoline flow. The pressure recommended is 1 pound, but to be on the safe side it is well to pump up to 3 pounds, thus allowing for any inaccuracies in the gauge.

Another possibility is that there is something the matter with the linkage operating the dash adjustment. There may be a slippage some place that prevents the motion of the lever on the dash from being transmitted to the carbureter, and therefore it would be well to look this mechanism over carefully.

How to Prevent Rims From Rusting

Editor THE AUTOMOBILE:—What will be good to put on wheel rims to keep them from rusting? They have rusted badly and cannot be gotten in good shape on account of deep rusts.

Stockport, O. C. O. HAWKINS, JR.

—Any good enamel or paint might be used to prevent rims from rusting, but the objection to using anything of this sort is that the tires tend to stick to the rims and for this reason it is best to use a mixture of graphite and oil. The graphite and oil are mixed to form a semi-liquid compound that is easily applied with a brush and then the rims are painted with it. The graphite has no tendency to stick to the tires and therefore tires are easily removed when it is used. Before applying it, however, the rims should be thoroughly cleansed of all rust by rubbing with emery cloth.

Power-Driven Tire Pump Development

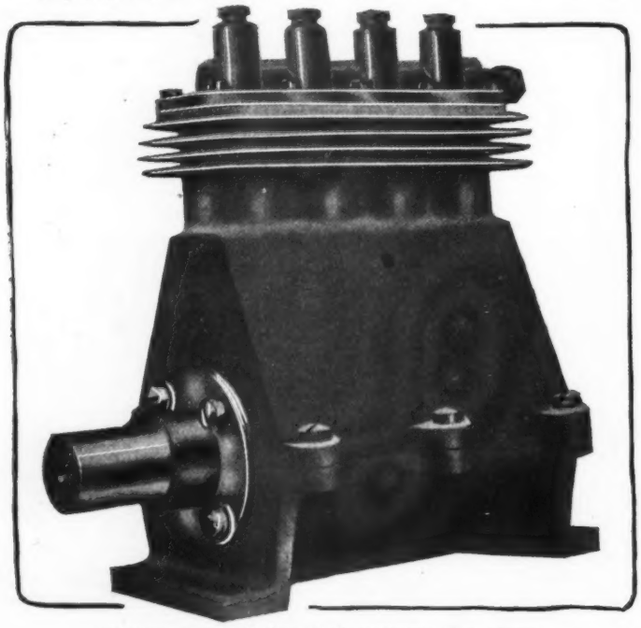
Great Variety of Designs Offered for 1914—Constructional Methods Follow Best Practice in Engine Manufacture—Can Inflate Tire in 1 to 3 Minutes

DUE to the popularity of the power-driven tire pump among motorists who appreciate its labor-saving possibilities when a tire must be inflated on the road, makers of these machines have been on the increase within the last 12 months, and along with those concerns which have been at the business for several years form a branch of the automobile industry which is steadily gaining ground. The machines themselves have undergone great refinement and simplification within the year and today are capable of inflating the average size tire in a remarkably short space of time—1 to 3 minutes.

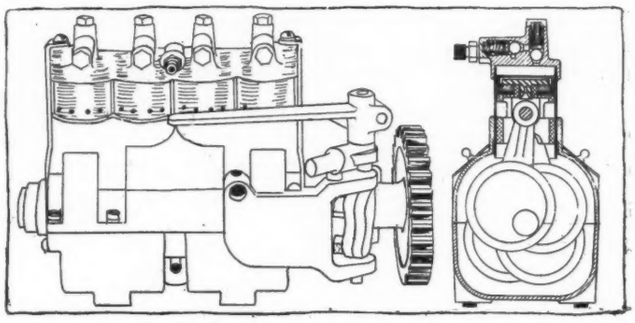
In fact, the fitting of tire pumps has come in for much consideration by the up-to-date car designer. Several makes of cars appear now with engine driven pumps of one form or another which are inbuilt as an integral part just as much as are the carbureter, water pump, magneto and so on. Several installations are to be found where the pump occupies a prominent position along with the water pump and electric generator being driven from the same shaft. In other cases, makers who have not supplied a tire pump as standard equipment have gone so far as to make provision for the later attachment of such a device should the car owner decide at any future time that he wants to rid himself of tire inflation by hand.

And so, with the kindly attitude of the public and the car makers as well, the tire pump business has prospered. Today we have on the market some highly perfected little machines. They are really built along the lines of the automobile engine. They have forged crankshafts, or eccentric shafts, have pistons and connecting-rods patterned after those of the gasoline engine in many instances and show the finest of workmanship.

The four-cylinder tire pump with its cylinders cast in a block is very popular, as is also the two-cylinder machine of the same kind. Water cooling of these does not seem to be a necessity, as most of them are designed with cooling flanges for air cooling. Some makes incorporate eccentrics for the reciprocation of the pistons, while others make use of miniature crankshafts with the conventional design of crank throws. Cast iron leads for the making of the cylinders as does also the type of piston using compression rings. There is one prominent maker, however, who has made a success of the leather plunger piston.



Bastian four-cylinder high-pressure tire pump



Kellog four-cylinder pump, showing lever for meshing gear

But the vertical power air pump is not alone in the field. There are some with the cylinders horizontal. In fact, several special machines are offered which are surprising for the originality of their design.

Abell

Unlike most other power tire pumps on the market, the Abell, which comes from the factory of the Standard Thermometer Co., Boston, Mass., has its three cylinders arranged horizontally instead of vertically. The machine has much the appearance of an electric generator or motor. It is intended to be driven either from a position on the motor or from a gearbox mounting. The most efficient way would be to hook it onto the end of the pump shaft or magneto shaft in much the same way as a magneto is mounted and driven.

The rotation of the horizontal shaft of the pump is converted into horizontal in-and-out motion of the pistons by means of a form of wabble-disk within the pump. The moving parts are mounted on ball bearings. Cylinders have a bore of 1 7-16 inches and stroke of 1 1-2 inches and the machine works at any speed up to 500 revolutions. At this speed, it takes it 1 minute to inflate a 34 by 4 tire to 75 pounds. Dimensions are: Weight —6 pounds; overall length—9 7-8 inches; overall height—4 inches, and overall width—4 inches.

Bastian

Besides several other automobile accessories, the General Utility Co., Philadelphia, Pa., is the producer of the Bastian four-cylinder tire pump which is a very compact design of the air-cooled type. The cylinders are of cast iron in one piece with the upper half of the crankcase. The cylinder head which carries the inlet and outlet valves is a separate plate and bolts to the cylinders. The lower portion of the crankcase is also the base.

The main shaft is fitted with eccentric cams over which the ends of the brass connecting-rod straps pass. The cams themselves are forged integrally with the shaft and are so balanced that the shaft in rotating gives a flywheel effect—a feature which should materially decrease vibration of the machine when operating at high speeds. The strap ends of the connecting-rods are provided with take up for wear from constant contact with the cams. The cylinder head is constructed of red brass, and the bearings are phosphor bronze. As in most pumps of this kind on the market, the lubrication of the working surfaces is by means of a perfected splash arrangement.

The minimum speed at which the pump will work is 550 revolutions while its maximum is given as 1,000 revolutions per minute. The bore is 1 inch and the stroke 1 3-8 inches. Dimensions are: Weight—11 pounds; overall length—6 1-4 inches; overall height—7 3-4 inches; and overall width—4 3-4 inches.

Brown

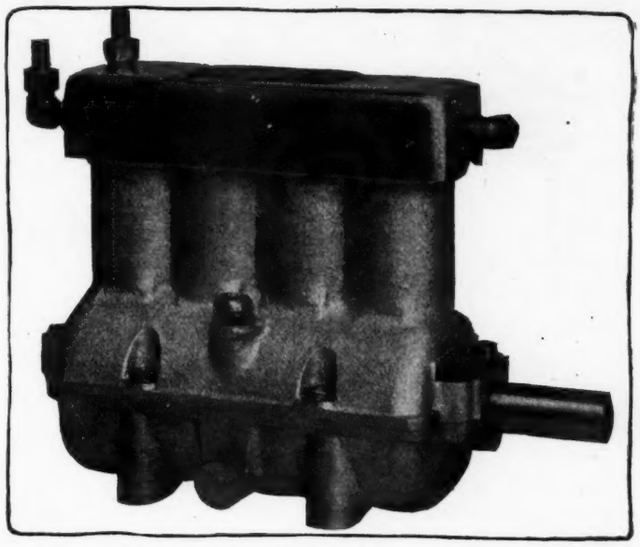
The Brown spark-plug type of tire pump operates on the compound principle. That is, there are really two pistons within—a large one below and a smaller one above it. These work in two different cylinder bores. The pressure on the lower piston is, of course, multiplied on the air being compressed above the smaller and top piston. Valves take care of the sending of the air to the tires. It is, of course, necessary that the tire receive pure air, and a special breather valve prevents the taking in of gases due to the breaking up of the vacuum of the engine by it.

The pump is well made and has gray iron cylinders, while the pistons are fitted with compression rings as in any other pump. With this pump a special form of spark-plug is used. This plug has a special base which screws into the cylinder head in the usual way. But the porcelain portion carrying the electrodes is removable by means of a bayonet lock construction. The lower end of the Brown pump has the same bayonet lock design as the removable part of the plug, and slips into the socket easily, a wrench of special form being provided to set it up tight against leakage. A smaller type of impulse pump, known as the Brown Junior, is also made for the owners of small cars.

Besides the impulse pump, the Brown Co., whose factory is in Syracuse, N. Y., is now offering a four-cylinder, gear-driven air pump which is suitable for starter equipment or tire inflation. This has a bore of 1 1-2 inches and weighs 10 pounds. The overall diameter is 4 1-2 inches. It will inflate a 34 by 4-inch tire to the standard pressure in about 3 minutes. The Brown Co. also makes several other styles of power pumps for various requirements.

Dewey

The Dewey power tire pump is of the so-called spark-plug type. When it is desired to inflate a tire, a spark-plug is removed from one of the engine cylinders, the pump screwed in in its place and the motor run idle on the three remaining cylinders. The compression and suction of the cylinder to which the pump is attached furnishes the motive power for the tire pump. The air chamber has a bore of 1 5-16 inches and the stroke is 3 inches.

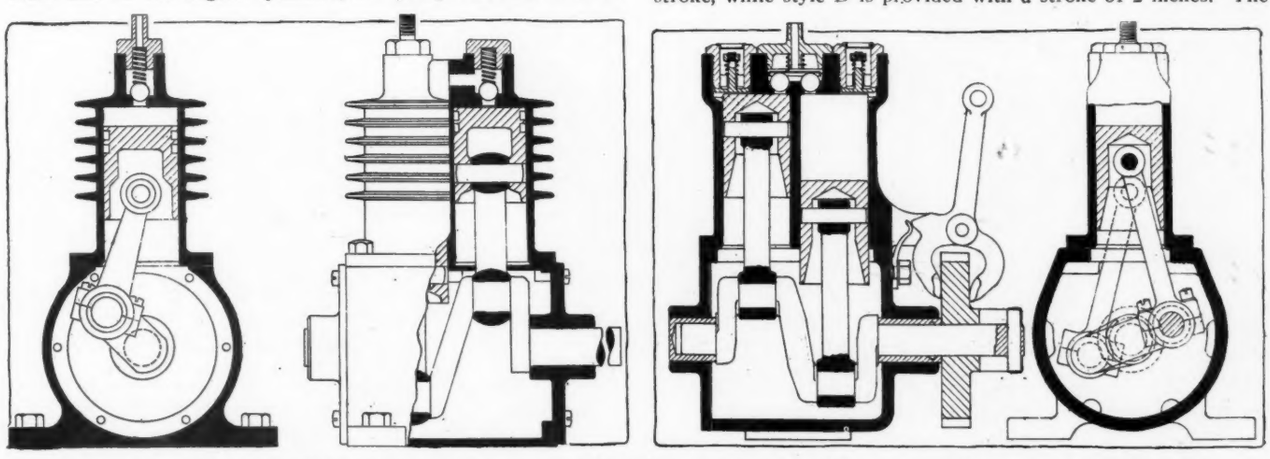


Lipman tire pump built on engine lines with forged crankshaft, ringed pistons and with or without water cooling head

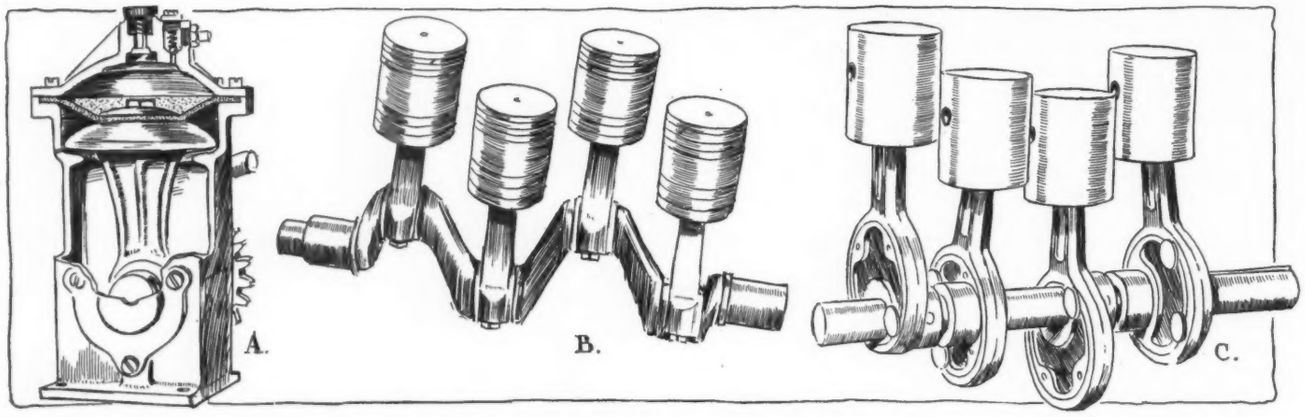
The maker states that the pump works best when the motor is run at a speed between 400 and 500 revolutions a minute, which is only moderately fast. It will inflate a tire in from 3 to 4 minutes depending somewhat on the compression stroke of the motor cylinder to which it is attached. It is stated that the cylinder gases do not reach the pump at all. By the use of a large breather valve, pure air is taken into the engine cylinder during the suction stroke which gives that particular cylinder the full compression so that during the compression stroke, a pressure from 50 to 75 pounds is developed, which pressure is utilized in forcing the air piston upward and driving the air from the pump into the tire. The Dewey-Anderson Co., New York City, makes this pump.

Hanna

The Troy Auto Specialty Co., Troy, N. Y., manufactures power tire pumps in two styles. Both of these are two-cylinder designs of the air-cooled type with the conventional cooling flanges around the cast-iron cylinder blocks. The principal difference in the two, which adhere closely to the same general design throughout, is in the stroke. Style C has a 1 1-2-inch stroke, while style D is provided with a stroke of 2 inches. The



Hanna two-cylinder air-cooled crankshaft type pump. Master air compressor. Note common delivery space and ball valve



A, Noll-Taylor rubber diaphragm air pump. B, forged steel crankshaft and ringed pistons of Lipman four-cylinder model. C, plain pistons and electric drive of Stewart four-cylinder pump

bore of both is 1 1-2 inches. They are designed with the regular aluminum barrel crankcase construction with the cylinders bolting to this portion which also forms the base. They have cast-iron pistons each fitted with two compression rings; have forged crankshafts with conventional crank throws, and the connecting-rods and bearings are made of manganese bronze.

The bearings for the crankshaft are mounted in the end plates which bolt to the base proper. These plates allow ready access to the inside of the machines. The Troy maker of these pumps does not stipulate that they must be mounted in any special position, but of course such a location must be obtained that the machine can be operated from an exposed shaft, usually through gear connection.

As to the capacity of these machines, the Style C will inflate a 34 by 4 tire to 80 pounds at 500 revolutions in 4 minutes; at 1,000 revolutions, it cuts the time to 2 1-2 minutes for the job and at 1,600 revolutions, it will do it in 1 minute and 40 seconds. Style D requires 2 minutes and 15 seconds at 500 revolutions. These figures are obtained from the maker. Dimensions:

	Style C	Style D
Weight:	6.5 pounds	9.5 pounds
Overall length:	5 1-4 inches	6 inches
Overall height:	7 1-4 inches	8 1-2 inches
Overall width:	4 1-4 inches	5 inches

Herz BB

A twin-cylinder power tire pump is offered by Herz & Co., New York. This is known as the BB and has vertical cylinders cast together with air cooling flanges around the top. The cylinder casting is separate from the crankcase and base to which it bolts rigidly. The pump has a double throw forged crankshaft of the conventional design and works the well-fitted pistons through a stroke of 2 1-2 inches, which is somewhat longer than that ordinarily found in these machines. The bore is 1 3-8 inches. The normal speed is around 375 revolutions a minute, and some idea of the capacity of the machine can be gained from the fact that on test it has pumped a pressure of 100 pounds per square inch in a tank 18 inches long and 6 inches in diameter in 1 minute when running from 375 to 4,000 revolutions a minute. No figures as to its work with tires can be given, since no tests of this nature have been made.

The lubrication is by splash, and each cylinder has its intake and delivery valves which are contained within housings screwing into the heads of the cylinders. A safety valve is placed back of and between the exhaust valves, making it impossible to pump up more than a certain predetermined pressure up to 200 pounds. Dimensions are: Weight—7 pounds; overall length—7 inches; overall height—11 inches; and overall width—3 1-2 inches.

Kellogg

The Kellogg pump, made by the Kellogg Mfg. Co., Rochester, N. Y., is a four-cylinder type which is now offered in two models, namely, an air-cooled or tire inflating type and a water-cooled, heavy duty, high-pressure design. The first of these is naturally used more for tire inflating purposes than the other which is more generally employed in connection with air cranking apparatus.

The Kellogg pump is compact in design, and the pump case which is made of a special aluminum in two halves is so constructed that there is no waste space. The case is split along the center line of the main shaft, the bearings for which are in each end. The top of the Kellogg power tire pump in which the check valves are located is of special, non-porous brass. Each cylinder is provided with a double check valve. Unlike many such devices, the pistons and connecting-rods do not get their reciprocating motion from cranks, but each rod's lower end is an eccentric which imparts the desired motion. The pistons are of the plunger form, that is, each carries a special leather packing ring at its top which is in cup form. Piston rings of metal are not used with this construction. The cylinder diameter is 1 1-2 inches, while the stroke of the pistons is 1 inch.

Connecting-rods in the Kellogg construction are of bronze, while the cams themselves are drop forgings ground to size. The main bearings are of babbitt. The nameplate on the side of the die-cast crankcase covers a hand hole which gives access to the interior of the pump. The eccentric cams which lift the pistons are placed at 90 degrees to each other, which makes for a steady supply of air.

The oiling of an air pump is very important. Kellogg lubricates the whole working mechanism by splash from the links. To prevent any oil from being in the air sent to tires, a separator is provided which is said to remove any trace of oil spray.

The Kellogg pump is most efficient when operated at from 550 to 600 revolutions a minute, although it will pump below these speeds. It is stated by the manufacturer that less than 2 minutes are required to inflate a 34 by 4-inch tire to 75 pounds per square inch.

The drive for this pump is possible in a number of different locations. The most popular is from the water pump shaft of the motor though it has also been successfully driven from the camshaft and the transmission shaft. In the latter case, an extension jackshaft is used. It is always connected so that a small gear on its main shaft may be meshed with a gear on the driving shaft through a lever, or so that a lever throws a clutch connecting the pump with its driving mechanism.

With the pump 15 feet of tubing is provided. Dimensions of the pump are: Weight—about 10 pounds; overall length—7 7-8 inches; overall height—6 7-8 inches and overall width—3 1-2 inches.

Kingston

The Kingston is a new product of the Kokomo Electric Co., Kokomo, Ind. This pump is a two-cylinder vertical type with

the cylinders separate and made of extra heavy steel tubing. The new pump is a good example of light weight construction coupled with compact design.

The cylinders have a bore of 1 1-4 inches and the stroke is 2 1-2 inches. The pump is really built along the same lines as a two-cylinder gasoline engine. It has a conventional crankshaft of drop-forged steel mounted on plain bearings. The connecting-rods are of bronze and have plain bearings also. The piston packing is of leather supported by steel rings which are ground to size. The crankcase is made of cast aluminum. Cylinders are held down onto the crankcase by two long bolts, one at either end of the machine. These bolts pass from a yoke at the top which is a single unit and really forms the head of both cylinders. In this head are the outlet check valves.

The pump is intended to be driven by coupling to the end of an exposed shaft such as that used to actuate a generator, water pump, etc. A shifter mechanism is a part of the machine and is equipped with a small lever for engaging and disengaging the apparatus when desired. The Kingston will inflate a 34 by 4 in about 3 minutes.

Lipman

The Lipman pumps made by Lipman Mfg. Co., Beloit, Wis., are along the same general lines of the automobile motor in miniature. The illustration of the crankshaft of the four-cylinder type with the pistons and connecting-rods assembled thereon will bring this out forcibly. The connecting-rods, which are of bronze, have the conventional type of strap ends held in place by two bolts. The crankshaft is a forging and is furnished in 5-8 and 3-4 inch sizes to meet the requirements of the purchaser.

The cylinder block and upper half of the crankcase are integral and made of close-grained iron. The crankcase is split along the center line of the crankshaft and the lower half is of aluminum and has integral bosses so that the machine may rest upon a base plate. The cylinder head is removable and carries the inlet and outlet valves which are bevel seated types. This head securely bolts down onto the cylinder casting and between the two there is a gasket to prevent leakage. Then over the valve mechanism and head is placed an aluminum hood which gives a very clean-cut appearance to the whole and at the same time prevents foreign matter from getting around the valve parts and pipe connections. The Lipman pump is also supplied with a waterjacketed head on if desired. This head is interchangeable with the plain head on the same cylinder block. The water-jacketed construction is recommended where the machine is used for high pressure work. The pump gets its oiling by splash.

The bore of the outfit is 1 1-4 inches and the stroke the same. The pistons are supplied either as a two-ring design or with a single ring, the cost of the latter being slightly less than the former. The two-ring type is intended for high pressure work, while the one-ring pistons are sufficient for tire inflation work.

Besides the four-cylinder Lipman, a two-cylinder design is also on the market. This has the same design characteristics as its larger brother and presents the same outward appearance. It comes with either a water jacketed head or a plain head. Dimensions of the four-cylinder type are: Weight—10 pounds; overall length— 7 3-8 inches; overall height—6 3-8 inches; and overall width—3 1-2 inches.

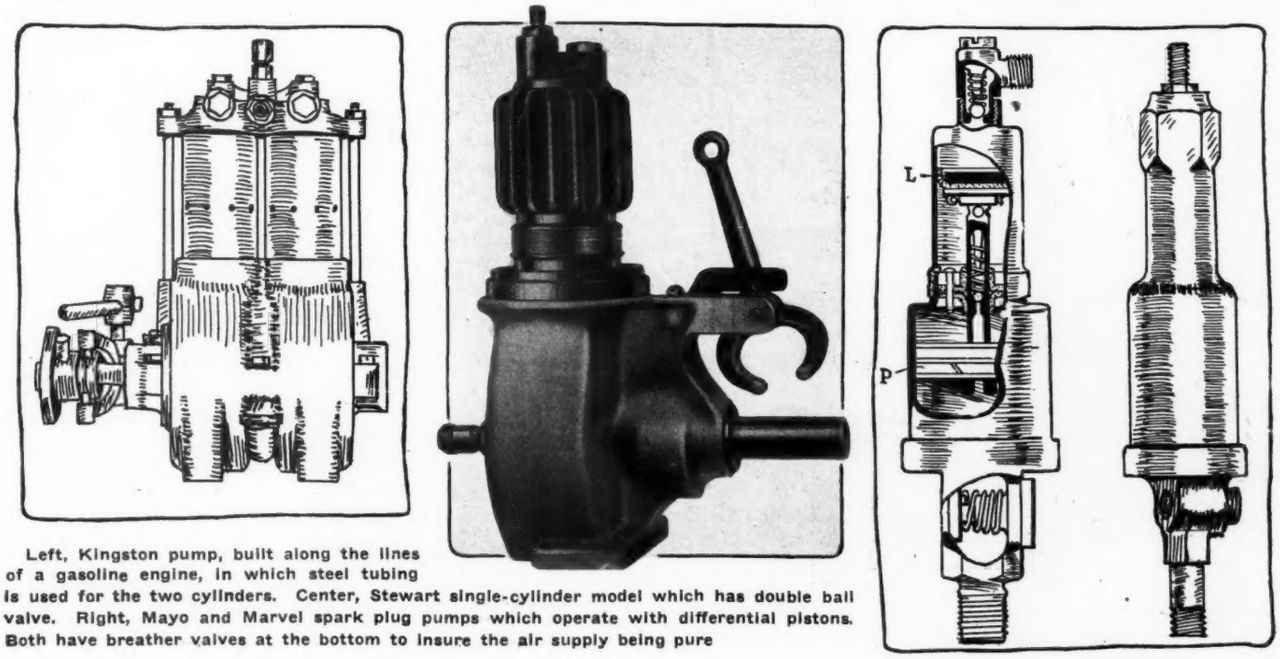
Manzel

The Manzel tire pumps are of the two-cylinder, air-cooled variety and come in two sizes. Type A has a bore of 1 3-8 inches and a stroke of 1 1-2 inches, while type B, which has a capacity about one-half greater than A, has cylinders which are 1 5-8 inches in diameter and its stroke is 1 3-4 inches. Both sizes are similar in design and construction.

Type A which is illustrated is typical. The air cooling fins pass around the twin cylinder casting which bolts to a crankcase which is a separate part. The Manzel pump is really built along the lines of the conventional gasoline engine. The pistons are each fitted with two compression rings, and connect with the drop forged steel crankshaft through bronze connecting-rods. The cylinders, pistons and rings are made of gray iron. The crankshaft is mounted at either end in a bronze bearing of good size. At either end of the crankcase is a large plate held in place by machine screws, which performs the double function of closing the case end and carrying the bearing for the shaft.

The pump is oiled in the usual way by splash. The air intakes are on either side of the cylinders below the cooling fins and are well screened to keep it free from dust and oil. The ball check valves through which the air goes to the tires are in the cylinder heads. Each pump is also provided with a safety relief valve to prevent pumping too great a pressure into the tires. This may be set at any desired pressure and when that has been reached, all excess air will pass out through the relief opening.

The Manzel pump is most generally attached to the engine through a bracket mounting. It is supplied with either a clutch shifting mechanism or a gear shifter or without either of these.



Left, Kingston pump, built along the lines of a gasoline engine, in which steel tubing is used for the two cylinders. Center, Stewart single-cylinder model which has double ball valve. Right, Mayo and Marvel spark plug pumps which operate with differential pistons. Both have breather valves at the bottom to insure the air supply being pure

Although the pump may be operated at any speed from 400 to 1,000 revolutions, it should be run at about 600 and at this speed takes about 2 minutes to pump a 36 by 4 1-2-inch tire to 90 pounds pressure, according to the maker. This refers to style A. The larger pump requires about 1 1-3 minutes to do the same job when running at 700 revolutions. Hose outfits are furnished with the Manzel pumps which are made in Buffalo, N. Y., by the Manzel Bros. Co. These consist of 15 feet of hose and a tire gauge. Dimensions:

	Style A	Style B
Weights: 5 Pounds (without shifter)	———	———
Overall length: 6 7-8 inches	7 3-4 inches	
Overall height: 8 inches	8 inches	
Overall width: 4 1-8 inches	3 1-2 inches	

Marvel Spark-Plug Pump

The Marvel tire pump is of the type which screws into a spark-plug hole and which operates through the compression of the motor. It is of compound design, there being a smaller cylinder above the main cylinder. A rod connects the pistons operating in these two cylinders and when the pressure within the engine forces the lower piston upward, compressing the air above it, the upper piston also moves upward, multiplying the pressure above it also which was partially compressed by the lower piston on its previous stroke. When the higher piston is at the top of its stroke, the air above it escapes to the tire. A breather at the bottom of the apparatus prevents any but pure air from entering. This pump is said to be capable of inflating a 37 by 5 in from 3 to 4 minutes. The Marvel is a product of the Marvel Auto Supply Co., Cleveland.

Master

The Master tire pump may be had with either one or two cylinders, and although it is of the same design and construction in either case, the bore of the two-cylinder is slightly less than that of the single-cylinder model. That is, the former has a cylinder diameter of 1 3-8 inches, while the latter measures 1 1-2 inches. The stroke of both is 1 3-4 inches.

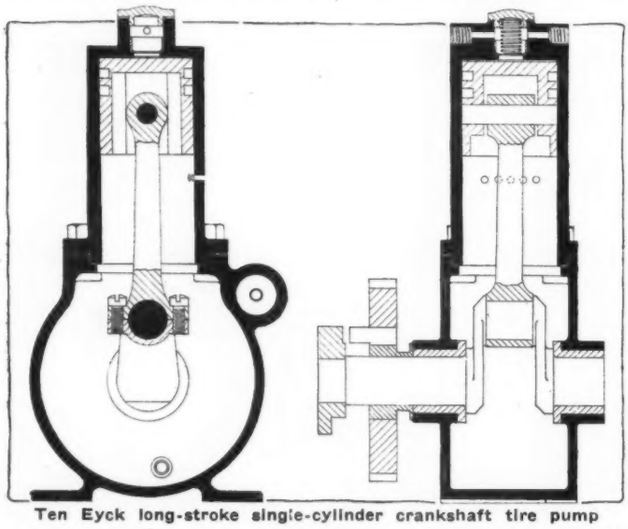
In the Master construction, the cylinder or cylinders bolt to a crankcase of the barrel form, while the crankshaft is of the conventional type with regular crank throws to get the reciprocal motion of the pistons. No piston rings are used with pumps of this make, the pistons being accurately ground to fit the cylinders which are also ground to size. This accuracy is said to prevent oil leakage past the pistons.

Master pumps have automatic splash lubrication and can be either clutch or gear driven. The preferred location is on the motor.

These pumps, which, by the way, are made by the Hartford Machine Screw Co., Hartford, Conn., will run at any speed varying from 350 to 850 revolutions per minute, but the recommended speed is 600 revolutions. The single cylinder pump will inflate a 34 by 4 tire to 75 pounds in 2.5 minutes, while the two-cylinder will do the same job in 1 minute less. This double-cylinder model will also pump a 37 by 5 tire to 100 pounds in less than 2 1-2 minutes, it is claimed.

The Hartford concern states that the Master pumps are intended as a manufacturers' proposition and have not as yet been sold through dealers for installation on cars already in use, although fittings for all makes of cars will probably be designed and carried later. Dimensions:

	Single-Cylinder	Two-Cylinder
Weight: 7 pounds		10 1-4 pounds
Overall length: ———		7 3-16 inches
Overall height: ———		8 7-16 inches
Overall width: ———		5 inches



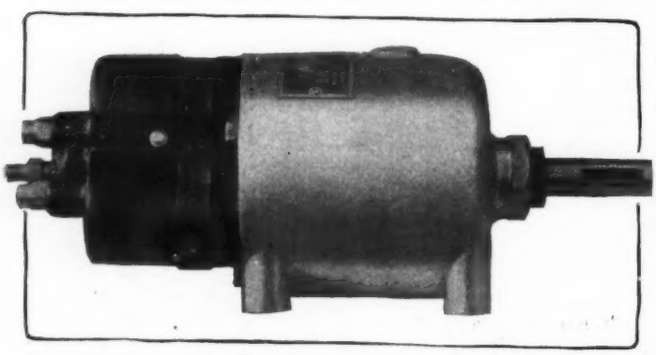
Ten Eyck long-stroke single-cylinder crankshaft tire pump

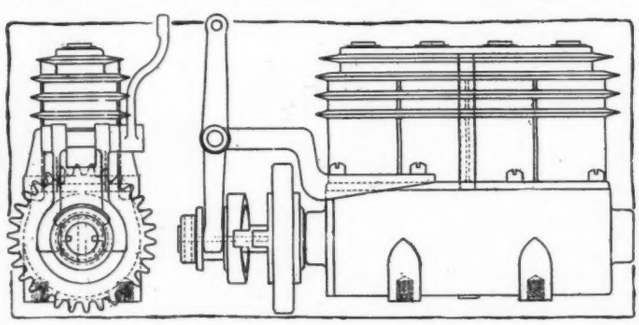
Mayo Spark-Plug Pump

The Mayo is an impulse tire pump and is designed to be screwed into a spark-plug hole in the top of one of the cylinders which has been vacated by a spark-plug. The pump is of the construction which compounds the pressure received from the engine, this being done by the use of two cylinders of different bore. The lower cylinder is the larger and the pistons within them are connected together by a hollow rod fitted with a check valve. Thus when the lower piston P is forced upward by the pressure of the motor compression below, it compresses the air above it which has been previously drawn in on the suction stroke through a breather valve. On the next stroke, this compressed air is allowed to escape into the upper chamber where it gets its final compression on the next upward stroke before being allowed to go to the tire. The Mayo has a 3 to 1 compounding, that is, if there is a 50-pound compression pressure in the engine, the pump delivers the air at about 150 pounds pressure. The upper piston L is a leather plunger type, while the lower is fitted with two diagonally split rings. A 34 by 4 tire gets its normal inflation in about 4 minutes with the Mayo, it is said. The Mayo is produced by the Mayo Mfg. Co., Chicago.

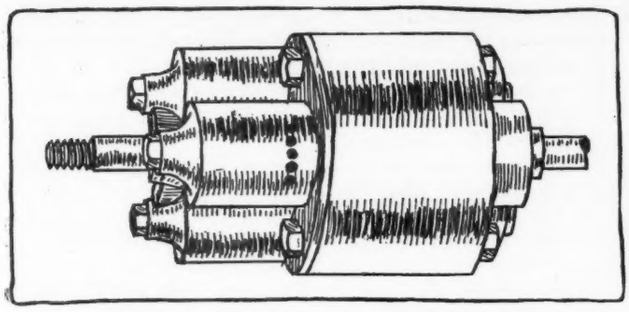
Motopump

The Motopump, product of the Universal Mfg. Co., Minneapolis, Minn., is on the market in both two- and four-cylinder designs, which are designated as models 20 and 21, respectively.





Abell three-cylinder horizontal tire pump. Universal pump with clutch and wheel for chain drive



Tri-Phoon three-cylinder horizontal tire pump

These are air-cooled with fins of proper size running around the tops of the cylinder blocks.

Motopumps are really miniature engines, being designed with conventional crankshafts, pistons carrying compression rings, connecting-rods and so on. In fact, the maker states that the pumps have been designed and constructed as nearly like the automobile motor as is consistent with air compressor use. The cylinders which bolt to the crankcase are of cast iron; the crankshaft is forged; the pistons are cast iron and have eccentric rings; the connecting-rods are phosphor bronze; the outlet valves are bevel seated.

The preferred location of the Motopump is on the motor, and it is intended to be driven in any convenient way—either with exposed gears which may be made to mesh, or a clutch or silent chain drive may be used. In best operation, either the four-cylinder pump or the two-cylinder should run at about 500 revolutions a minute, when they will pump a 34 by 4-inch tire to 75 pounds in 1 1-2 and 3 minutes, respectively.

The bore of either model is 1 1-2 inches and the stroke 1 1-4 inches, which proves a very efficient combination, it is said. The lubrication is by splash and any grade of motor oil is satisfactory. A small oil separator, little larger than a watch, is provided which prevents oil or oil vapor from entering the tires.

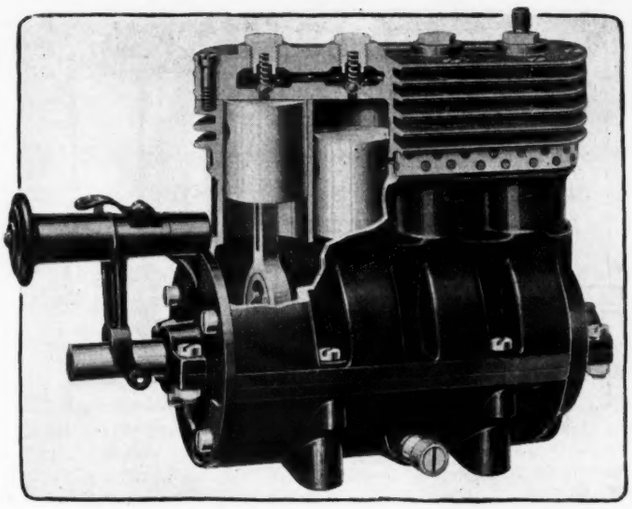
The width of the crankcase of the Motopump is of special note. This is 2 3-4 inches and comes about largely through the use of a patented connecting-rod lower end. Instead of using a conventional strap end to go around the crank pin, the Motopump has a thin strip of metal passing around the lower part of the rod end and fastening above the bearing portion. This greatly reduces the size of the end, but does not impair the strength. Dimensions:

	Model 20—(4-Cyl.)	Model 21—(2-Cyl.)
Weight:	8 1-2 pounds	5 1-2 pounds
Overall length:	7 3-4 inches	4 9-16 inches
Overall height:	6 1-8 inches	6 1-8 inches
Overall width:	2 3-4 inches	2 3-4 inches

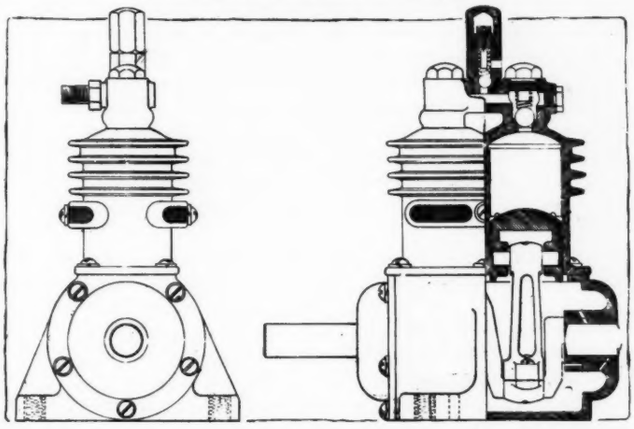
Noil-Taylor

Unique in construction is the Noil tire pump manufactured by the Taylor Mfg. Co., Chicago. This pump does away with pistons and might be said to eliminate the cylinder construction also. As its name implies, this pump is so made that it is impossible for oil to get into the tire. A glance at the illustration of the Taylor pump will show why this is so.

The pump consists essentially of an eccentric shaft which drives a forged pitman or connecting-rod up and down within a housing which is integral with the part inclosing the eccentric shaft. The top of this pitman is of mushroom form and fastened to it is a rubber diaphragm which is circular in form. The outer edge of this diaphragm is securely bolted down against the top flange of the pitman and eccentric case by the head portion which also has a flange. Thus the rubber diaphragm completely seals the air chamber above it from the case below, preventing any oil passing from the working parts below into the tire. The cylinder head above the diaphragm is a steel stamping, nickel-plated and polished, and on it are mounted the air inlet and outlet valves together with the connection for attaching the hose.



New Stewart four-cylinder eccentric drive model, air cooled and with the cylinders cast in one piece

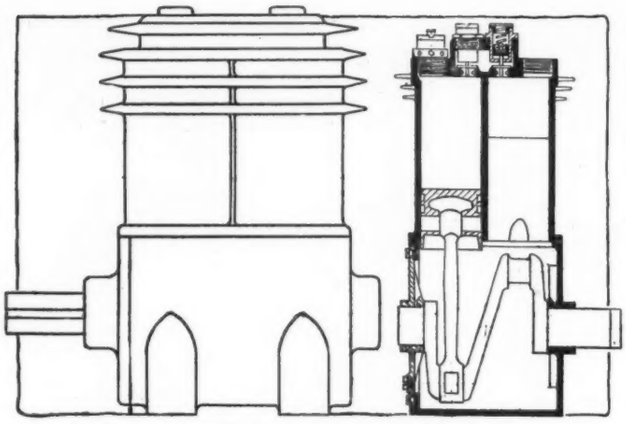


Manzel tire pump which has engine type of crankshaft and ringed pistons

The Taylor pump is usually mounted on the motor and works most efficiently at a speed of 600 revolutions a minute. It requires about 3 minutes to pump a 34 by 4 tire to 75 pounds pressure. The pump is attached to the motor by special bracket, a gear on its eccentric shaft mating with a twin gear on any exposed driving shaft when pumping of a tire is desired. The mounting of the Noil pump on the 1914 Marmon is an ingenious example of what can be done along this line. In this case, the pump is carried on a bracket which is cast with the engine crankcase. The regular solid eccentric shaft is replaced by a hollow forged steel shaft through which the engine's water pump shaft passes. A clutch mounted on the tire pump shaft is engaged with that on the live member when it is desired to inflate a tire. Dimensions are: Weight—7 pounds; overall length—6 inches; overall height—7 1-2 inches and overall width—3 inches.

Peerless Special

Under the trade name of Peerless Special, the Peerless Accessories Manufacturers, Chicago, Ill., have developed a power tire pump for special attachment to Ford cars. This pump is a single-cylinder affair and is intended to be placed in front of the engine, between it and the radiator. Its installation on any Ford is said to be a simple matter, requiring only the drilling of a hole in the frame on the left side of the car for fastening the cylinder in place, and the removal of the radiator, starting crank and fan pulley. The eccentric operating the piston within the cylinder through a connecting-rod construction is then slipped over the shaft and fixed in position. Thus when the crankshaft



Universal and Herz BB two-cylinder crankshaft type pumps

extension rotates it operates the pump when same is clutched. A shifting lever which passes to the front operates the clutch device so as to connect the pump when desired. The pump has a cast-iron cylinder, rings and piston and is equipped with 12 feet of rubber tubing. In place of the old fan pulley, a special one is provided which is in unit with the eccentric construction.

The Peerless concern also makes a four-cylinder, engine-driven pump which is of the conventional vertical type with cylinders in a block and air cooled. It may be driven in any way from an exposed shaft, either by gears or chain. The overall dimensions of this four-cylinder pump are: Length—8 3-4 inches; height—6 1-2 inches; and width—3 1-8 inches.

Stewart

The Stewart-Warner Speedometer Corp., Chicago, which enjoys an enviable position in the field of speed-recording instruments, offers two- and four-cylinder power air pumps under the trade name of Stewart.

The four-cylinder pump has a bore of 1 7-16 inch and a stroke of 1 1-8. It is an air-cooled type with the cylinders all in one block and the cooling fins running horizontally around the upper portion. The crankcase is divided along the center line of the main shaft and the upper half is integral with the cylinder block. The air intakes are screened and are ranged along the sides of the cylinders, while the outlets are of the ball-check type, one being in the top of each cylinder. The air lead connection is mounted on top of the pump above cylinder No. 1.

The operation of the valve mechanism is very simple. The piston uncovers the ports in the cylinder when it nears the bottom of the stroke and then air rushes in to fill the vacuum caused by the down stroke of the piston. On the upstroke the air is compressed until the discharge valves, which are held by springs, are forced off their seats allowing the escape of the air to the tire.

The pistons in the Stewart are of the plain type and carry no rings. They are simply small cylindrical pieces having steel heads and being ground accurately to size and lapped into the cylinders. These pistons are reciprocated by eccentrics on the shaft, the lower ends of the connecting rods forming the eccentric straps. The crankcase and cylinders are made of gray iron, while connecting rods and mainshaft are drop-forged steel. This eccentric construction makes a compact assembly so far as overall length is concerned and at the same time reduces the number of separate parts to the minimum.

The single-cylinder type which is also air-cooled is designed along the same lines as the four-cylinder. Its cooling fins run vertically, however, and the crankcase is all in one piece, the cylinder being a separate part and forming no part of the shaft housing. The cylinder bore is 1 7-16 inch and the stroke is 2 1-2 inches. With this pump, the air is protected with a double ball valve, so that in the event that dirt should hold one of the valves open, the other would be sure to act, and in this way cause no loss of air.

The preferred location of the Stewart pumps is on the motor on a bracket, but they are of course adaptable to any other position where a means of driving and mounting are feasible. Suitable mechanism for shifting the pump gear in mesh with the driving gear is provided, or, a construction for use with a clutch may also be had.

No particular speed is set by the maker at which these machines work best. The four-cylinder will, however, inflate a 36 by 4 1-2 tire to 90 pounds pressure in 3 minutes under normal conditions, while the single cylinder pump will do the same work in 5 minutes.

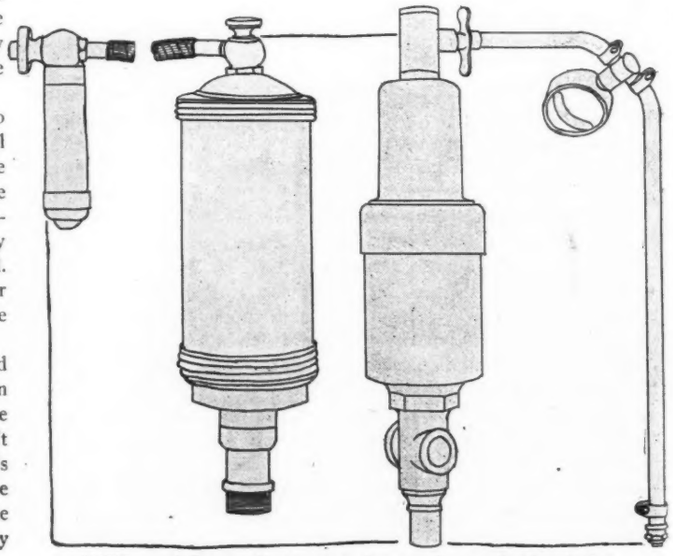
Dimensions of the four-cylinder are: Overall length—10 inches; overall height—8 inches; overall width—4 inches.

Ten Eyck

A somewhat longer stroke than usual is that of the Ten Eyck tire pump which comes in one and three-cylinder sizes. The stroke is 2 1-4 inches, and the bore 1 3-4 inches. The cylinders are vertical and bolt conventionally to the crankcase which is of the usual barrel type with one of the crankshaft bearings mounted at either end. Each of the cast-iron pistons has two eccentric rings, while it is operated by the usual form of bronze connecting-rod which straps to the forged crankshaft.

The Ten Eyck is air-cooled and its moving parts get their lubrication by splash. Air inlet holes are drilled in the side of the cylinders, while check valves in the cylinder heads let the compressed air into the tire or storage tank.

The pump is most suitably attached to the engine, being provided with a baseplate for the purpose which is a part of the crankcase. It is usually driven through gearing with either water pump shaft or some other similar shaft. A distinctive feature is the method of gearshift which is automatically controlled by a separate cylinder and piston, made integral with the pump on the side of the crankcase. The piston in this cylinder, which has a diameter of 3-4 inch, is operated by the pressure in the storage tank or tire. The back pressure from the air receiver slides the pump gear in mesh with the driving gear. But the pump gear runs idle on its shaft until the two gears are partly meshed, when a clutch also provided is engaged. Disconnecting the air pump from the air receiver allows the pressure to escape from the automatic cylinder. The gears are then drawn out of mesh by a spring, since the air pressure in the automatic cylinder no longer holds them in mesh. In this operation, the clutch is first disengaged, permitting the pump gear to run idle while being drawn out of mesh. This construction for automatic engagement and disengagement of the tire pump is said to allow shifting of the gears at any engine speed.



Utility and Brown tire pumps for use in spark plug holes

The Ten Eyck pumps run best at about 500 revolutions a minute and at this speed, the single cylinder one will inflate a 34 by 4 tire to its normal pressure in about 2 minutes. Dimensions are:

	One-Cylinder	Three-Cylinder
Weight:	9 pounds	18 pounds
Overall length:	5 inches	10 inches
Overall height:	9 1-2 inches	9 1-2 inches
Overall width:	4 1-2 inches	4 1-2 inches

Tri-Phoon

The Tri-Phoon air pump, made by the Green & Swett Co., Boston, Mass., is a three-cylinder construction in which the pistons are reciprocated by a high-powered rotary cam. The pistons are controlled on the cam surface by means of roller bearings. Both cam and roller bearings are constructed of hardened and ground steel. The air intakes are in the sides of the pistons, while the check valves are in their heads. The pistons are fitted with metal compression rings.

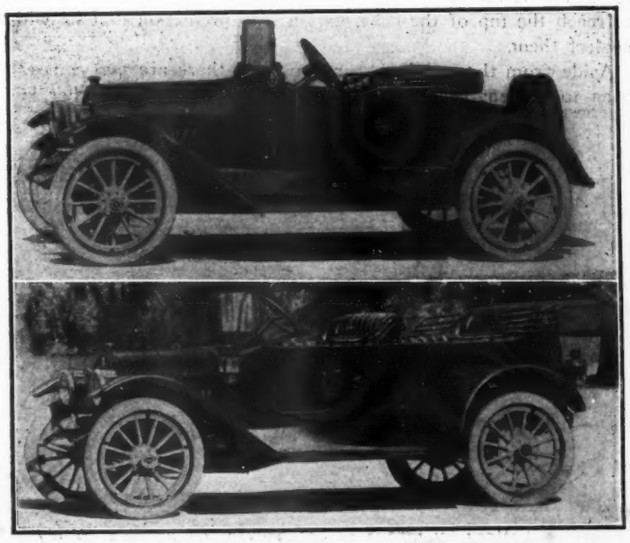
This pump can be arranged in any position where it may receive a positive drive from engine or transmission. It may be run at any speed up to 1,500 revolutions a minute, but the recommended speed is 800, at which velocity it will deliver a steady flow of air at 115 pounds pressure. Dimensions are: Weight—5 pounds; height—5 1-2 inches, and diameter—3 1-2 inches.

Utility Spark-Plug Pump

The Hill Pump Valve Co., Chicago, Ill., offers the motorist a type of tire pump which is designed to be screwed into a spark-plug hole after the plug has been removed. The engine does the work of sending compressed air to the tire, operating on the remaining three or five cylinders as the case may be.

This impulse pump, which comes in two sizes, has a piston within which acts in the usual way to compress the air and send it to the tires. The large size made by Hill is called the Utility and the smaller, which is made especially for Ford cars, the Utility Junior. These pumps have but one cylinder and work at about 350 revolutions a minute of the engine. The Utility is 7 inches long, weighs 4 1-2 pounds and is said to inflate a 34 by 4-inch tire to 75 pounds in from 2 to 4 minutes. The smaller pump is 6 inches long, weighs somewhat under 3 pounds and will do all the necessary inflating on small cars such as the Ford. In these pumps, provision is made against sending any but pure air to the tires.

With either of these pumps a hose is furnished as well as a very efficient gauge which allows the operator to put the desired pressure in his tires. This gauge is attached at the tire end of the apparatus.



Upper—Empire streamline roadster. Lower—Touring car model fitted with electric lighting and starting system

Empire 1914 Features

One Roadster Has Streamline Body—Runabout and Touring Car with Electric Starting and Lighting System

THE Empire Automobile Co. introduced two brand new products at the New York show—a streamline roadster mounted on the standard Model 31 chassis, and the electrically started and lighted models of the touring car and the roadster.

The new roadster typifies the best of the streamline tendency and altogether is a car of exceptional appearance and character. The streamline design begins with the hood, which in a graceful curve slopes to join flush with the sweeping, deep cowl under which is placed the gasoline tank. The end of the cowl is equipped with a one-piece windshield of ingenious design that may instantly be converted into rain or clear vision form or may be tilted to ventilate the driving comfort and so cool it in hot weather.

The commodious driving compartment has a wide seat placed low to give the greatest driving comfort and convenience. Standard upholstery and deep Turkish cushions are employed and the equipment is completely identical with that of the touring car. At the rear is a commodious decked-in baggage compartment nearly a yard square which allows adequate storage space for distant touring or for the needs of business or professional men who at times demand storage space for two or three large cases or bags. At the rear of the compartment opening upward is a wide door. This new streamline roadster is sold completely equipped for $900, the same price as the standard touring car. With the electric system, the new touring car sells for $1,025.

In the electrically started and lighted car the electrical equipment consists of two units—a Remy generator and a Remy starting motor of the 6-volt system. The generator has its own armature and commutator, as has the starting motor, but the two are combined in one field and one housing. This apparatus runs at the extremely low rate of but twice engine speed.

Control Entirely Electrical

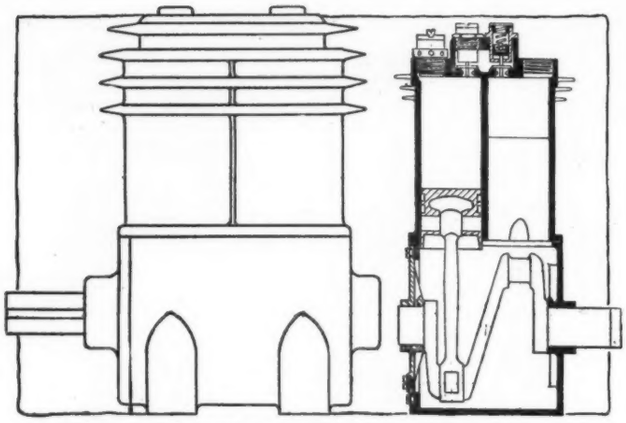
The control is entirely electrical. The cutting in and out of the generator at a certain engine speed is accomplished by a well-designed automatic cut-out which the makers claim has always given absolute satisfaction. The generator begins to charge at 9 miles per hour and it carries the full lamp load at a speed of 12 miles an hour which will assure an efficient service of the battery under all conditions. The cut-out and fuse box is arranged on top of the apparatus in a most accessible position and is absolutely protected from oil or water.

The whole installation is such that the starting motor and generator can be taken off the car without dismantling the engine. The battery used is the six-volt 100-ampere hour Willard storage battery and is of more than adequate size for starting and lighting the car.

The electric headlights are 6-volt, 12-candlepower types with electrically operated dimmers. The tail light is an oil and electric lamp of 2 candlepower. On the dash is provided an ammeter which enables the driver to observe the action of the battery, a feature quite unusual on cars of moderate price.

Control Is by Pedal

The starter is set in action by a control switch pedal. There are no other controls or levers to complicate the starting. Simply press the foot and the starting motor spins the engine, and automatically cuts out as soon as the engine is running. When the car reaches 9 miles per hour the generator takes up its duty and sends current to the battery. The whole apparatus with its automatic electrical control takes care of itself and leaves the motorist no chance of injuring it by carelessness.



Universal and Herz BB two-cylinder crankshaft type pumps

extension rotates it operates the pump when same is clutched. A shifting lever which passes to the front operates the clutch device so as to connect the pump when desired. The pump has a cast-iron cylinder, rings and piston and is equipped with 12 feet of rubber tubing. In place of the old fan pulley, a special one is provided which is in unit with the eccentric construction.

The Peerless concern also makes a four-cylinder, engine-driven pump which is of the conventional vertical type with cylinders in a block and air cooled. It may be driven in any way from an exposed shaft, either by gears or chain. The overall dimensions of this four-cylinder pump are: Length—8 3-4 inches; height—6 1-2 inches; and width—3 1-8 inches.

Stewart

The Stewart-Warner Speedometer Corp., Chicago, which enjoys an enviable position in the field of speed-recording instruments, offers two- and four-cylinder power air pumps under the trade name of Stewart.

The four-cylinder pump has a bore of 1 7-16 inch and a stroke of 1 1-8. It is an air-cooled type with the cylinders all in one block and the cooling fins running horizontally around the upper portion. The crankcase is divided along the center line of the main shaft and the upper half is integral with the cylinder block. The air intakes are screened and are ranged along the sides of the cylinders, while the outlets are of the ball-check type, one being in the top of each cylinder. The air lead connection is mounted on top of the pump above cylinder No. 1.

The operation of the valve mechanism is very simple. The piston uncovers the ports in the cylinder when it nears the bottom of the stroke and then air rushes in to fill the vacuum caused by the down stroke of the piston. On the upstroke the air is compressed until the discharge valves, which are held by springs, are forced off their seats allowing the escape of the air to the tire.

The pistons in the Stewart are of the plain type and carry no rings. They are simply small cylindrical pieces having steel heads and being ground accurately to size and lapped into the cylinders. These pistons are reciprocated by eccentrics on the shaft, the lower ends of the connecting rods forming the eccentric straps. The crankcase and cylinders are made of gray iron, while connecting rods and mainshaft are drop-forged steel. This eccentric construction makes a compact assembly so far as overall length is concerned and at the same time reduces the number of separate parts to the minimum.

The single-cylinder type which is also air-cooled is designed along the same lines as the four-cylinder. Its cooling fins run vertically, however, and the crankcase is all in one piece, the cylinder being a separate part and forming no part of the shaft housing. The cylinder bore is 1 7-16 inch and the stroke is 2 1-2 inches. With this pump, the air is protected with a double ball valve, so that in the event that dirt should hold one of the valves open, the other would be sure to act, and in this way cause no loss of air.

The preferred location of the Stewart pumps is on the motor on a bracket, but they are of course adaptable to any other position where a means of driving and mounting are feasible. Suitable mechanism for shifting the pump gear in mesh with the driving gear is provided, or, a construction for use with a clutch may also be had.

No particular speed is set by the maker at which these machines work best. The four-cylinder will, however, inflate a 36 by 4 1-2 tire to 90 pounds pressure in 3 minutes under normal conditions, while the single cylinder pump will do the same work in 5 minutes.

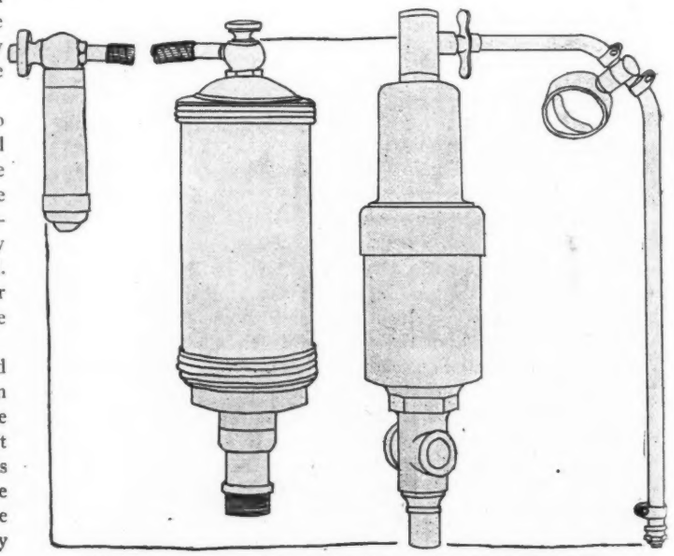
Dimensions of the four-cylinder are: Overall length—10 inches; overall height—8 inches; overall width—4 inches.

Ten Eyck

A somewhat longer stroke than usual is that of the Ten Eyck tire pump which comes in one and three-cylinder sizes. The stroke is 2 1-4 inches, and the bore 1 3-4 inches. The cylinders are vertical and bolt conventionally to the crankcase which is of the usual barrel type with one of the crankshaft bearings mounted at either end. Each of the cast-iron pistons has two eccentric rings, while it is operated by the usual form of bronze connecting-rod which straps to the forged crankshaft.

The Ten Eyck is air-cooled and its moving parts get their lubrication by splash. Air inlet holes are drilled in the side of the cylinders, while check valves in the cylinder heads let the compressed air into the tire or storage tank.

The pump is most suitably attached to the engine, being provided with a baseplate for the purpose which is a part of the crankcase. It is usually driven through gearing with either water pump shaft or some other similar shaft. A distinctive feature is the method of gearshift which is automatically controlled by a separate cylinder and piston, made integral with the pump on the side of the crankcase. The piston in this cylinder, which has a diameter of 3-4 inch, is operated by the pressure in the storage tank or tire. The back pressure from the air receiver slides the pump gear in mesh with the driving gear. But the pump gear runs idle on its shaft until the two gears are partly meshed, when a clutch also provided is engaged. Disconnecting the air pump from the air receiver allows the pressure to escape from the automatic cylinder. The gears are then drawn out of mesh by a spring, since the air pressure in the automatic cylinder no longer holds them in mesh. In this operation, the clutch is first disengaged, permitting the pump gear to run idle while being drawn out of mesh. This construction for automatic engagement and disengagement of the tire pump is said to allow shifting of the gears at any engine speed.



Utility and Brown tire pumps for use in spark plug holes

The Ten Eyck pumps run best at about 500 revolutions a minute and at this speed, the single cylinder one will inflate a 34 by 4 tire to its normal pressure in about 2 minutes. Dimensions are:

	One-Cylinder	Three-Cylinder
Weight:	9 pounds	18 pounds
Overall length:	5 inches	10 inches
Overall height:	9 1-2 inches	9 1-2 inches
Overall width:	4 1-2 inches	4 1-2 inches

Tri-Phoon

The Tri-Phoon air pump, made by the Green & Swett Co., Boston, Mass., is a three-cylinder construction in which the pistons are reciprocated by a high-powered rotary cam. The pistons are controlled on the cam surface by means of roller bearings. Both cam and roller bearings are constructed of hardened and ground steel. The air intakes are in the sides of the pistons, while the check valves are in their heads. The pistons are fitted with metal compression rings.

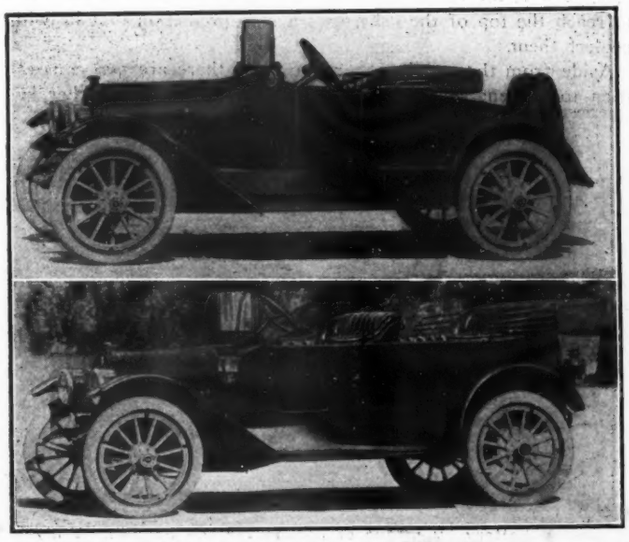
This pump can be arranged in any position where it may receive a positive drive from engine or transmission. It may be run at any speed up to 1,500 revolutions a minute, but the recommended speed is 800, at which velocity it will deliver a steady flow of air at 115 pounds pressure. Dimensions are: Weight—5 pounds; height—5 1-2 inches, and diameter—3 1-2 inches.

Utility Spark-Plug Pump

The Hill Pump Valve Co., Chicago, Ill., offers the motorist a type of tire pump which is designed to be screwed into a spark-plug hole after the plug has been removed. The engine does the work of sending compressed air to the tire, operating on the remaining three or five cylinders as the case may be.

This impulse pump, which comes in two sizes, has a piston within which acts in the usual way to compress the air and send it to the tires. The large size made by Hill is called the Utility and the smaller, which is made especially for Ford cars, the Utility Junior. These pumps have but one cylinder and work at about 350 revolutions a minute of the engine. The Utility is 7 inches long, weighs 4 1-2 pounds and is said to inflate a 34 by 4-inch tire to 75 pounds in from 2 to 4 minutes. The smaller pump is 6 inches long, weighs somewhat under 3 pounds and will do all the necessary inflating on small cars such as the Ford. In these pumps, provision is made against sending any but pure air to the tires.

With either of these pumps a hose is furnished as well as a very efficient gauge which allows the operator to put the desired pressure in his tires. This gauge is attached at the tire end of the apparatus.



Upper—Empire streamline roadster. Lower—Touring car model fitted with electric lighting and starting system

Empire 1914 Features

One Roadster Has Streamline Body—Runabout and Touring Car with Electric Starting and Lighting System

THE Empire Automobile Co. introduced two brand new products at the New York show—a streamline roadster mounted on the standard Model 31 chassis, and the electrically started and lighted models of the touring car and the roadster.

The new roadster typifies the best of the streamline tendency and altogether is a car of exceptional appearance and character. The streamline design begins with the hood, which in a graceful curve slopes to join flush with the sweeping, deep cowl under which is placed the gasoline tank. The end of the cowl is equipped with a one-piece windshield of ingenious design that may instantly be converted into rain or clear vision form or may be tilted to ventilate the driving comfort and so cool it in hot weather.

The commodious driving compartment has a wide seat placed low to give the greatest driving comfort and convenience. Standard upholstery and deep Turkish cushions are employed and the equipment is completely identical with that of the touring car. At the rear is a commodious decked-in baggage compartment nearly a yard square which allows adequate storage space for distant touring or for the needs of business or professional men who at times demand storage space for two or three large cases or bags. At the rear of the compartment opening upward is a wide door. This new streamline roadster is sold completely equipped for $900, the same price as the standard touring car. With the electric system, the new touring car sells for $1,025.

In the electrically started and lighted car the electrical equipment consists of two units—a Remy generator and a Remy starting motor of the 6-volt system. The generator has its own armature and commutator, as has the starting motor, but the two are combined in one field and one housing. This apparatus runs at the extremely low rate of but twice engine speed.

Control Entirely Electrical

The control is entirely electrical. The cutting in and out of the generator at a certain engine speed is accomplished by a well-designed automatic cut-out which the makers claim has always given absolute satisfaction. The generator begins to charge at 9 miles per hour and it carries the full lamp load at a speed of 12 miles an hour which will assure an efficient service of the battery under all conditions. The cut-out and fuse box is arranged on top of the apparatus in a most accessible position and is absolutely protected from oil or water.

The whole installation is such that the starting motor and generator can be taken off the car without dismantling the engine. The battery used is the six-volt 100-ampere hour Willard storage battery and is of more than adequate size for starting and lighting the car.

The electric headlights are 6-volt, 12-candlepower types with electrically operated dimmers. The tail light is an oil and electric lamp of 2 candlepower. On the dash is provided an ammeter which enables the driver to observe the action of the battery, a feature quite unusual on cars of moderate price.

Control Is by Pedal

The starter is set in action by a control switch pedal. There are no other controls or levers to complicate the starting. Simply press the foot and the starting motor spins the engine, and automatically cuts out as soon as the engine is running. When the car reaches 9 miles per hour the generator takes up its duty and sends current to the battery. The whole apparatus with its automatic electrical control takes care of itself and leaves the motorist no chance of injuring it by carelessness.

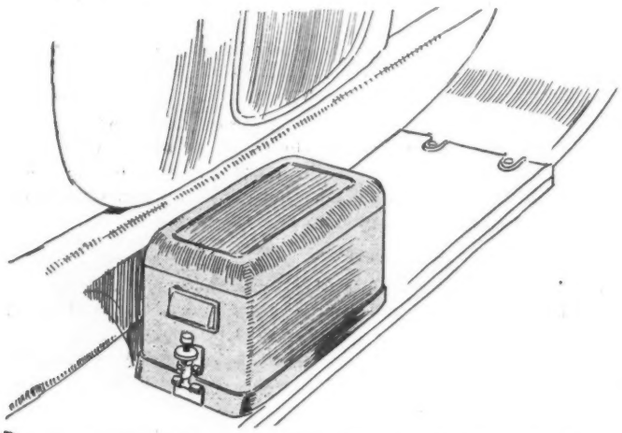
Variety of Storage Battery Mountings

Importance of Location—Chief Considerations Are Accessibility, Non-Interference with the Body Lines and Chassis Balance

By L. V. Spencer

THE paramount considerations in storage battery mounting are accessibility and proper fastening against vibration. Of nearly as much importance are suitable protection against mud and water, substantial hanging of the battery box or carrier, location close to the electrical units so as to reduce the wiring to the minimum, and the placing with respect to the other essentials so that the best possible chassis balance may be secured. While these points apply with equal force to the electric vehicle battery they refer here particularly to the smaller types used on the modern gasoline car for incorporation in the cranking and lighting system.

The matter of chassis balance is perhaps the first thing the car engineer thinks of, but the battery maker, on the other hand, has uppermost in his mind those points which will tend to make the care of the battery a comparatively simple matter. If he had his way, there would be no other location of the battery except on the running board, for here it is most easily reached and may most readily be removed. But present day dictates of body fashion decree that nothing shall encumber the running boards, and most engineers have succumbed to the edict. There are a few concerns, however, who do not believe in sacrificing this greater accessibility for the added smooth line effect which is obtained by placing the battery under the body or in some other concealed position.



A very accessible location. The Packard battery is on the running board. The cover comes down over the unit and fastens at the bottom. Air vents are provided in the ends of the box

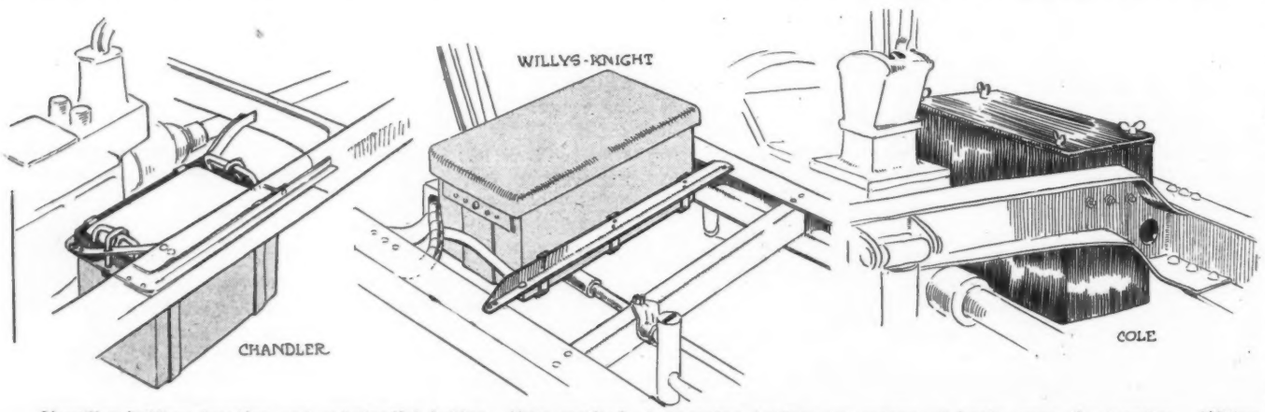
Cells Should Be Watered

There are two things of the greatest importance in storage battery upkeep. These are the addition of pure water to all the cells regularly and at sufficiently frequent intervals to keep the solution at the proper height, and testing the specific gravity of the electrolyte by means of a hydrometer to check the operation of the system. Due to the heat, in summer at least, the acid evaporates rapidly and in order to keep the plates covered water must be added at least every 2 weeks and preferably every week. If a portion of the plate is exposed to the air, sulphation takes place and that part of the plate is soon ruined, while the portion under the electrolyte at the same time is subjected to a higher rate of discharge which is a factor in reducing its life.

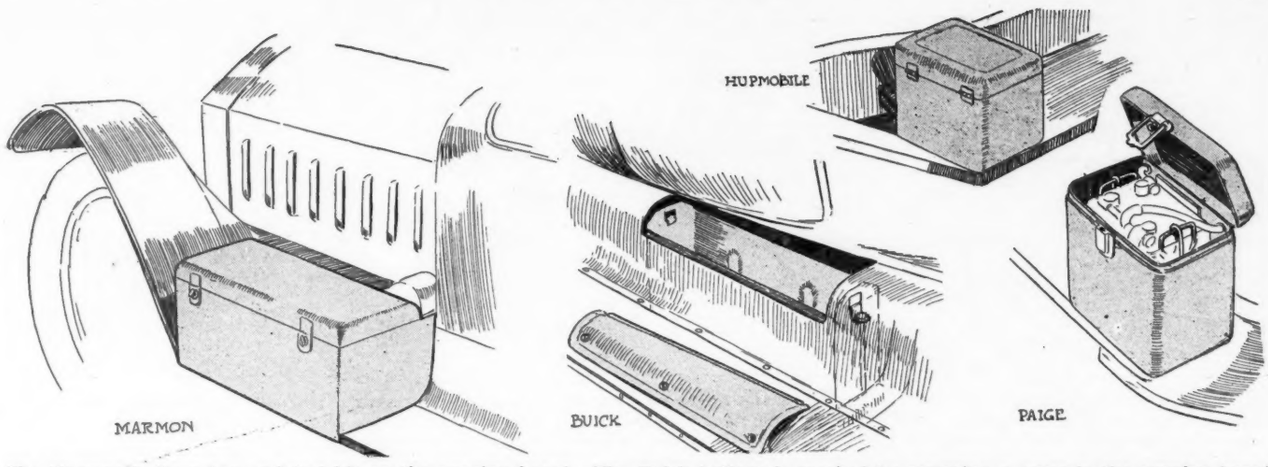
Keeping the density of the solution at the correct point is a great factor in the prolonging of battery life, and this can only be assured by the periodical hydrometer readings. The strength of the electrolyte is a good indication of the state of battery charge, and as the battery discharges the density falls, due to the taking up of the acid by the plates. Obviously all of the cells should be in the same condition of charge at all times, and the hydrometer readings are the simplest method of determining this.

Having seen the detrimental results to the battery of not adding water and checking the gravity regularly, it is obvious that the car designer must provide easy means of getting at the battery. For if the car owner must dismantle part of the machine to reach the top of the cells, it is a safe prediction that he will neglect them.

Aside from the running board position, there are two courses open to the engineer in placing the battery. It may either be



Chandler battery location and substantial holder. Note method of clamping battery by means of hooks over the handles. Willys-Knight battery mounting to go under front seat. The Cole battery is carried alongside the gearbox and is reached through the front floorboards



The Marmon battery box and tool kit on the running board. The Buick battery is reached by removing a cover in the running board apron. To the right, the Hupmobile and Paige methods of placing the battery on the running board

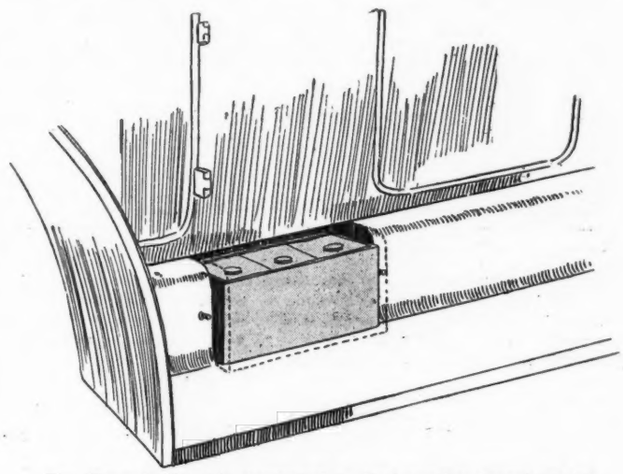
underslung from the frame or mounted above it on some form of cross member support. Of the two, the underslung method is the best for it allows the unit to be located under the floorboards of either the forward part or the rear compartment. This makes it necessary simply to raise these boards to expose the cells for inspection.

If the battery is carried on the chassis above the level of the frame rails, it must be positioned so as to go under either the front or the rear seat. Unless supported high enough on the frame to bring the top of the cells close to the level of the seat after the cushions have been removed, it is hard to get the eye in line with the reading of the hydrometer, and, due to cramped quarters, equally hard to properly add water through the plug holes. In the usual case where the battery is placed under the seat, it is down several inches and these difficulties are at once evident. Then, too, the average seat has a cross piece which makes it nearly impossible to fill or inspect that cell which is directly below it. However, this difficulty has been considered by many designers who have either mounted the battery so as to be at one side or the other of this partition, or have eliminated it entirely, making a continuous seat lid.

Under Floorboards a Good Location

It is true that the battery under the floorboards is nearer the ground and more subjected to the dirt and water, but if properly carried in a metal box, it is sufficiently protected. It is easier to inspect the solution in this position, and though not as accessible as the running board position would be, nevertheless it is the best compromise between this and smooth lines.

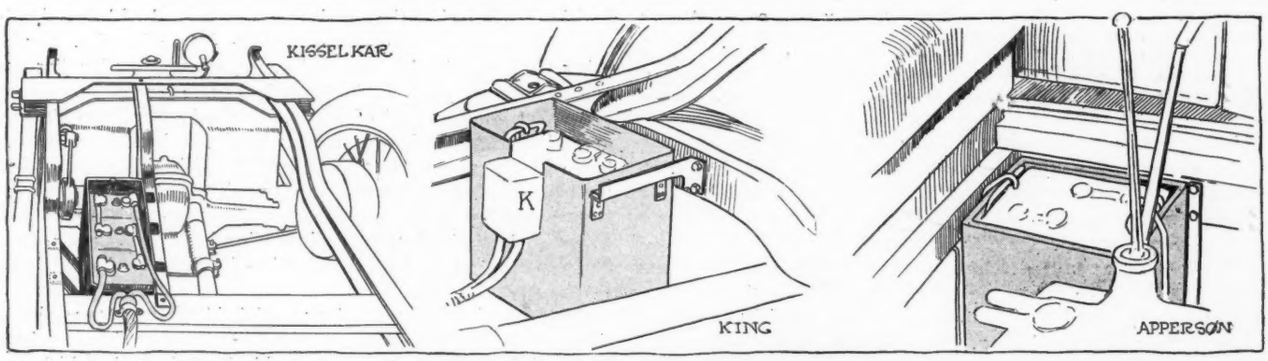
But the instances in which attention has not been given to this matter of reaching the battery and making possible its easy removal are fewer this year than last and indicate a step in the



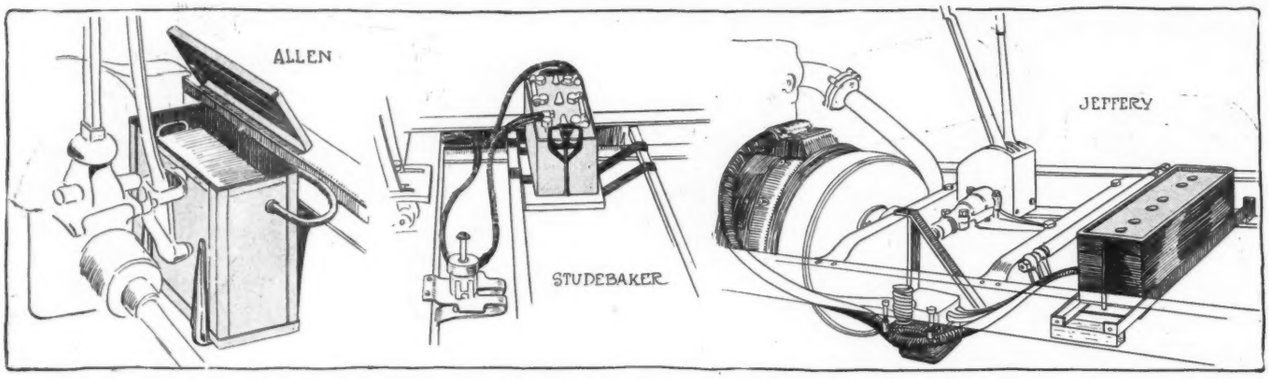
The Moon battery is concealed in the running board apron

right direction. One instance of very bad battery mounting was to be found in a car which has retired from the market within the last year. The battery was so hung beneath the body that it was impossible to get at the top of it except by unfastening the holding straps and lowering the entire unit. Needless to say, there were many cases of improperly cared-for batteries with this car.

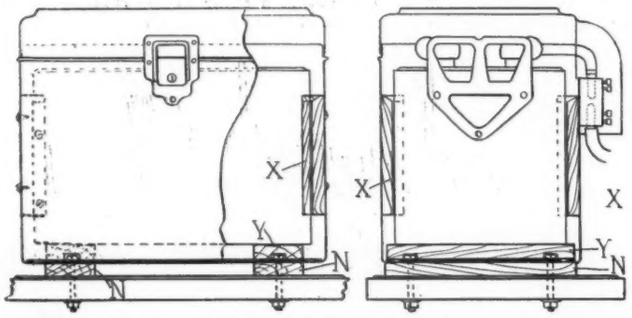
There is still another instance where the maker has placed the battery box on the running board, but defeats the purpose of this advantageous position by having a tool shelf above the battery, which is itself completely boxed in below. A lid of wood goes over it and is screwed down. To get at the battery, then, the car



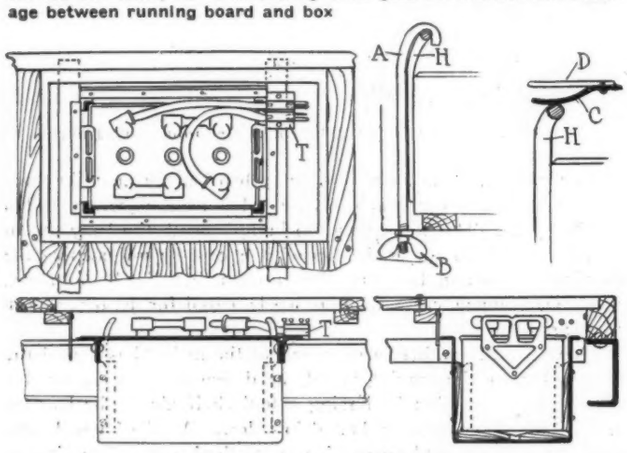
The KisselKar places the battery at the rear, underslung, so as to be easily reached through the floor. A cross member and a metal strip running parallel to the main frame rails back to the rear member form the basis for this mounting. The King battery is underslung from a cross member by brackets. The terminal block K is incorporated with the box. The unit is reached through the tonneau floor. At the right is shown the accessibility of the Apperson battery after the front floorboard has been taken up



The Allen utilizes the space between the gearbox and frame for hanging the box from substantial brackets on the frame. Studebaker places the battery under front seat and to one side, so as to be readily reached. The Jeffery battery is carried crosswise under the front seat. The seat cover makes possible its quick accessibility and easy removal. Two cross members carry it



Details of best method of mounting the battery on the running board. The box has corner pieces, X, between which the battery slips. The battery rests on cleats, Y, while the box, in turn, is carried on cleats, N. The battery thus gets ventilation and drainage between running board and box



Details of a good mounting of battery below floorboards. Note position of terminal block T and the battery box provided with wood bottom and well suspended. Inset shows details of two good ways of fastening batteries against vibration. 1—Hook A over handle H, which is drawn down by thumb nut B. 2—Spring C attached to top D of box bears down against handle H when in place

owner must first take out the tool shelf, after which he must remove two screws, when the battery is exposed. This is a more troublesome job than simply taking up a floorboard and it is a safe prediction that the battery in this case does not get the attention that the underslung one receives.

Good examples of underhung battery locations are Reo, Peerless, Premier, Studebaker, Marion, King, Case and Apperson. Overland, Buick and Moon have an especially good battery location, the unit being reached through a door in the side of the running board apron. Among those with batteries on the running board may be named the Packard, Hupmobile, Marmon, Paige and Stutz.

There are several cases of placing the battery alongside the gearset and underslung from the frame. This has to be in unit power plant designs, of necessity, where there is sufficient clear space between gearcase and frame and makes a compact assembly when looked at from the standpoint of the entire chassis arrangement. It is a good place to put the battery if far enough forward to be completely exposed when the floorboard is raised. But, in one or two cases, the top of the battery is half under the floorboard and half under the seat. This means that one or more of the cells must be reached through the seat cover, which is some 20 inches above. Removal is another problem in such location.

The space between driveshaft and frame is a good location provided the battery is not in close proximity to the exhaust pipe. This is especially a fault in summer, for the quicker evaporation of the water in the cells during this time of the year is further hastened by the heat of the exhaust. This fact has often been overlooked.

Another thing to be remembered is to place the battery as close as possible to the electric generator and motor so that the wiring may be short. There is considerable voltage drop in the wires and it is advantageous to cut this down as much as possible.

Several Methods of Clamping

There are several commendable methods of clamping down the battery. One very popular way is to run hooks over the top of the handles and to tighten these through the use of thumb nuts threaded to the other end of the hooks which go through the battery box or other stationary part of the battery holder. The advantage of the thumb nut is that, by tightening by hand, it is impossible to exert sufficient strain on the handle to break the wooden battery container. If this hook is tightened by a regular nut operated by a wrench, such excessive tightening is very possible. The horizontal bar is usually notched to prevent the hook from slipping off, and in some good battery constructions, the handles are bolted to the wood container instead of being simply screwed on. The bolts cannot pull out to injure the case. Studebaker, Jeffery, Kissel, King, Paige, Apperson and Chandler are among those who use the hook method of fastening.

Another good method of preventing the battery from shifting around is to fit the inside of the top of the sheet metal battery box with flat pieces of spring material which will press against the handles when the cover is in place. The force exerted on the battery handles is not very great, nevertheless it is amply sufficient to hold the battery against vibration. The Case battery box construction is a good example of this method of holding the battery.

Chalmers also has a good way of holding the battery firmly down on its bracket. A wooden saddle goes over the top of the box and is held down on either side by light rods which run through the bottom of the bracket.

The location of the battery so as to give the best balance pos-

sible to the chassis as a whole is of much importance and often to do this the engineer must effect a compromise with some of the locations which, purely from the battery standpoint, would be more advantageous. The average battery used in automobiles weighs around 60 pounds and this is enough to have considerable effect on the chassis. The cranking motor and generator probably add about the same amount more, so that the battery must of necessity occupy such a position as to balance them. Or, if one of these units is on each side of the power plant, the car designer may have to carry the battery in the center of the frame, so that its weight is balanced of itself.

It is very important that the battery be clamped in position to prevent its shifting around or vibrating when the car is in service.

Box Should Be Specially Prepared

No matter where the battery is placed, the box in which it should be carried should be specially prepared for its reception. Ventilation within it is very important, as is also provision for draining any water which might spill over either in filling or when the car is in service.

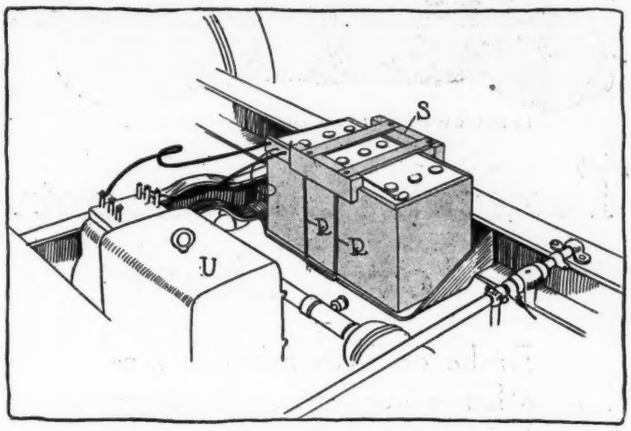
Probably the best way to arrange the box is to provide it with wooden corners within. These will serve as guides when slipping the battery into place and will give the necessary ventilation all around as well.

The bottom of the box in some of the best designs is often of wood which has grooves running to drain holes to take care of slopping over if the battery has been filled too full. An equally good method is to place cleats in the bottom of the battery box and to set the battery on these. This not only gives ventilation at the bottom, but serves to keep the container dry, which is a factor in its life. In the bottom of the box a drain is provided. The wooden pieces used in these boxes are often boiled in paraffin as a preservative.

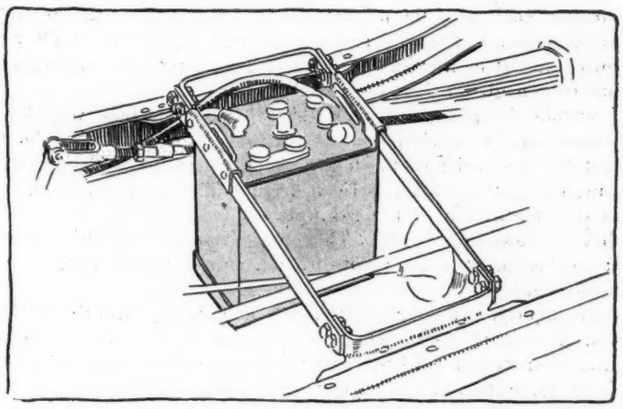
In the matter of wiring there are several points which are sometimes overlooked, but which add to the general insurance of a system against getting out of order due to short circuits and the like. It is good practice to take the wires through the metal battery box in fiber bushings which add to the insulating efficiency. The chafing of the wires on the somewhat sharp edges of the metal case is best guarded against in this way. The Case installation is a good example of the leading of the wires outside the box through such fiber pieces.

It is also advisable to loop the wires within the battery box somewhat so that any movement of the battery will be taken by the slack in the wires and will not damage the rigid connectors. There are instances where the connectors have been snapped off when wired too tightly and not given enough play to allow for jars of this kind.

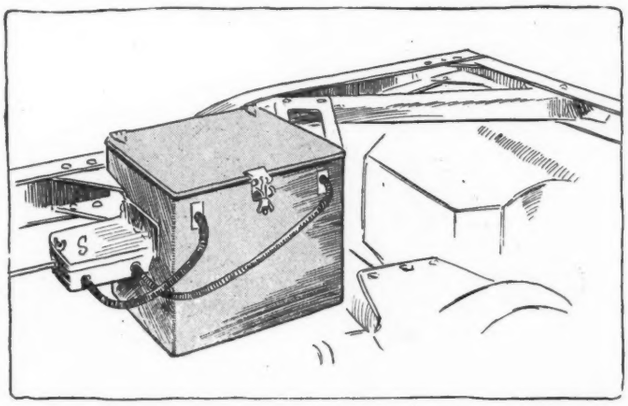
Many battery experts advocate the placing of the terminal block either on the outside of the battery box itself or near to it. This means that the main leads from the battery are short, and that the branching off to the starting system and the lighting system is done near the source of supply. This is preferable to taking the main leads to the dash and then branching to the two systems. In any case, accessibility must not be lost sight of in the terminal block location. Packard, Overland, Jeffery, Willys-Knight and King are good examples of such terminal block mounting.



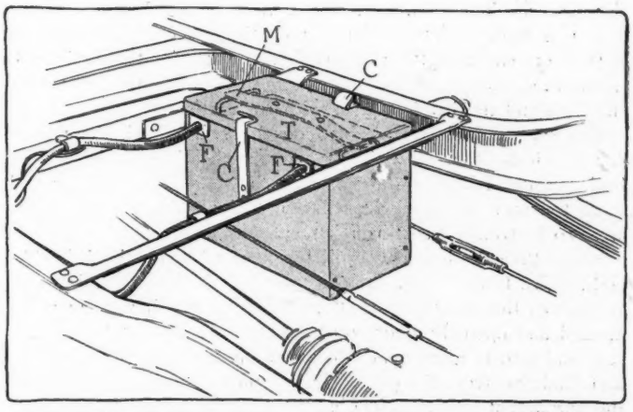
Method of carrying Chalmers battery under seat. Note the good way of holding down the battery on its bracket. The wooden saddle, S, is held down over it on either side by the rods, R, which run through the bracket base. The battery and electric unit, U, are so arranged as to balance one another



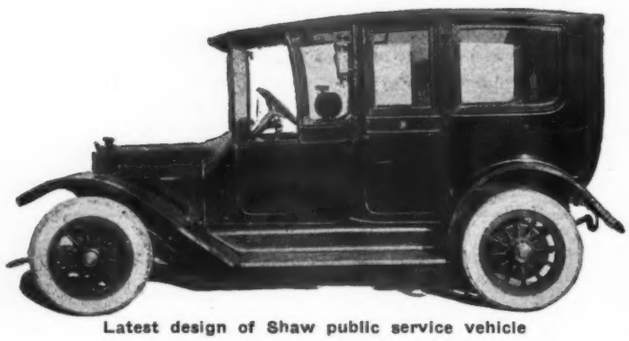
How the Reo battery is underslung from the frame. It is reached through the tonneau floor



On the Peerless the battery is carried in a steel box bracketed to the right side member of the chassis. The combined junction box and starting switch for the cranking motor is mounted directly on the side of the box, thereby simplifying the heavy main cable connections from the battery



The Case battery mounting is a very good example of simplicity and efficiency. The top of the case, T, is provided with the flat spring, M, the ends of which press down onto the battery handles, holding the battery in place. The cover, T, is in turn held by the clips, C. The wires pass out through the fiber blocks, F



Latest design of Shaw public service vehicle

Taxicab Co. Adopts Worm Drive

Brake on Transmission Another New Shaw Feature—Left Drive Is Now Standard

CONDITIONS of taxicab service require a highly specialized vehicle for economical operation. The Walden-W. Shaw Livery Co., Chicago, has found it impossible to obtain a chassis on the market which meets the requirements of public motor cab service and for the past 3 years has built its own cars. It is interesting to note that no change of any nature has been made on this chassis until now.

Within the past few weeks there have been some very important changes made in certain features of the car which show that the experience of the taxicab company points to designs of European rather than American origin. The chief alteration is in the substitution of the worm-driven rear axle for the bevel drive employed previously. This change was made solely to gain more silent operation, a point of importance in this service. Both torque and radius rods have been omitted in this new design thus simplifying the construction and doing away with the rattle that these parts make when they become worn. The springs have been strengthened to stand the thrust and torque incidental to the application of the power to the wheels.

Emergency Brake on Transmission

The emergency brake is on the transmission shaft just behind the gearset. This eliminates the extra rods and linkages necessary with the conventional location on the wheels, and does away with the attendant rattle and wear. The drum for this brake is 8 inches in diameter and is exceptionally wide, being 4 inches across the face and the band is lined with Raybestos.

The service brake is retained on the rear wheel, the reason for this being that with the frequent application of the service brake required in city traffic too much wear would be imposed upon the rear axle and propeller unit if all the braking strain were to be transmitted through them.

These taxicabs hereafter will be operated from the left side, right drive having been former practice. This change is made in spite of the fact that with the right drive the driver can reach around and open the doors on the curb side without leaving his seat and also is more handy to assist the passengers in entering and alighting from the cab. The reason of the change has been the paramount one of safety, as the company's tests have shown that accidents are one-third less with the left drive than they are with the right drive. This corresponds with the finding of the Yellow Taxicab Co., New York, as developed at the last S. A. E. meeting.

These comprise the alterations in the new chassis, which like the design of the chassis as a whole, are the product of Paul H. Geyser, mechanical engineer of the company. The motor used is of the four-cylinder vertical, L-head, block type, 4 1-8 by 5 1-4 inches. The valves are inclosed and have a diameter of 2 inches. The push rods are adjustable and present flat surfaces to the cams. The camshaft is forged integrally and is driven by helical gears in a separately inclosed compartment. The starting crank is mounted on extension of the gear compartment cover.

Lubrication is provided for by both constant level splash and force feed, the motor being equipped with two plunger pumps actuated by eccentrics on the camshaft. The bottom half of the crankcase is removable for the inspection or adjustment of connecting rods, camshafts, and so forth without disturbing the crank bearings. A Schebler carbureter and a fixed spark Bosch magneto are employed. The clutch is of the dry-disk type, the disks being ten in number, steel and Raybestos alternating, and are engaged by an adjustable coil spring. The clutch is provided with a brake to permit easy gearshifting. The gearset is the three-speed Brown-Lipe model mounted on Timken bearings. Throttle control is by an accelerator pedal so that there are no levers on the steering wheel. Two Spicer universals are used between the gearset and the rear axle which is a Timken, worm drive floating type.

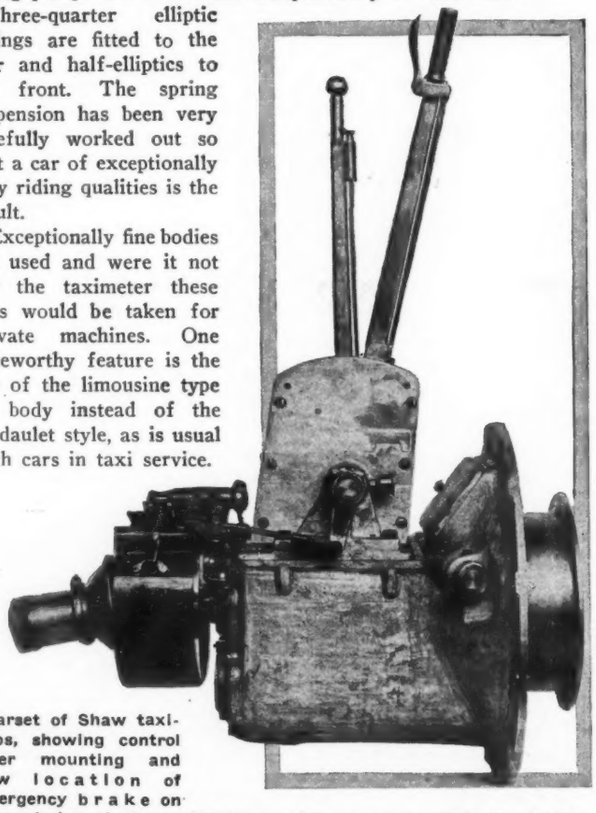
Accessible Power Plant Design

Gearset, motor and clutch are constructed so that each can be demounted quickly without disturbing the others; for instance, the gearset is so arranged that removal of the four bolts by which it is suspended allows the gearbox to be removed while the removal of six bolts permits the entire power plant to be slipped forward and out of the chassis. This includes the motor, radiator and entire lubrication and ignition system.

Simplicity of operation has been reached by clearing the steering post of all controls, at the same time provision against breakdowns has not been overlooked; for instance, the two lubricating pumps can be worked independently of each other.

Three-quarter elliptic springs are fitted to the rear and half-elliptics to the front. The spring suspension has been very carefully worked out so that a car of exceptionally easy riding qualities is the result.

Exceptionally fine bodies are used and were it not for the taximeter these cars would be taken for private machines. One noteworthy feature is the use of the limousine type of body instead of the landaulet style, as is usual with cars in taxi service.



Gearset of Shaw taxicabs, showing control lever mounting and new location of emergency brake on transmission shaft, immediately behind gearset. This illustration shows how the clutch and gearset can be removed as a unit

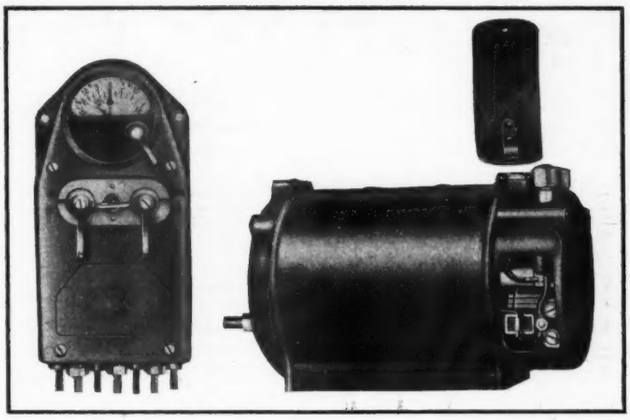


Fig. 1—Switchboard and generator of Bosch electric lighting system

Bosch Lighting Generator Out

12-Volt System with Special Switchboard and Lamps—Generator Has Standard Magneto Base

A COMPLETE electric lighting system has just been introduced by the Bosch Magneto Co. comprising generator, switchboard, lamps, etc., all of which have been designed and are being manufactured in the Bosch factory.

Dealing first with the generator, Fig. 1, this follows closely on the lines of the same company's magneto: that is to say, the baseplate carrying the anchor straps is provided with dowel pins which register with the holes in the base of the generator or the standard magneto; moreover, the height of the shaft is such that it can be driven by the existing magneto coupling, and the armature shaft may be arranged to couple up the magneto in tandem. The generator is designed to run at the same speed as the engine.

The generator can be secured from underneath by bolts or held by a steel strap. This holding strap is clamped by a single screw, which allows of the generator being rapidly and easily dismounted. All the cable terminals are interchangeable so far as size is concerned, but to prevent wrong connections being made each terminal is numbered to correspond with the number of its socket.

These terminals are so arranged that the outer metallic casing of the cable forms an "earth" or grounded return.

With regard to the output of the machine, the control is such that between the speed of 400 revolutions per minute and 3,500 revolutions, the lamps can be switched on and off in any combination while it is receiving current direct from the generator without the intervention of the battery. The voltage of the generator at 350 revolutions per minute, is 12 volts, while its normal output of 100 watts, or 7.5 amperes at 13.5 volts is reached when the speed of 650 revolutions per minute is obtained.

Constant Voltage Regulation

The generator is shunt wound and the excitation of the field magnets is governed by an automatic controller of the electromagnetic type in the switch board. This controller reduces the strength of the field as the speed increases and increases the strength as the speed decreases maintaining a constant output. It is claimed that the voltage maintains constant irrespective of the external load, so that there can be no flickering or alteration of the value of light even though the battery may be accidentally or otherwise disconnected.

With this control the batteries also are kept in condition. Being connected to an absolutely constant voltage line they can be changed to a predetermined extent and never will be overcharged. Thus the battery will only receive such charges as will bring it to normal and it will not become worthless due to overcharge. A 50-ampere hour battery is used.

On the face of the switchboard, Fig. 1, is an instrument reading to right or left of zero, according to whether it shows "charge" or "discharge," and the instrument switch is turned to one side to show voltage and to the other side to show amperage, the same dial and calibration serving for both readings. When the lower right hand switch is placed at "o" it is in the "off" position, D indicates that the dynamo current is switched direct to the lamps, B that the current is being supplied from the battery, and D B indicates that the battery and dynamo are both in circuit. When left lower switch is shown at "off" no lights are on. 1 indicates side and rear lamps "on"; 2 head, side and rear lamps "on"; and 3 head and rear lamps "on." The center key is removable, and locks all the switches, which are designed to withstand operation by means of the foot, and normal positions of all three are at the extreme of their movements in either direction.

Side Lamp Reflectors Fixed

The reflectors of the side lamps are attached and are a part of the front glass retainer. This arrangement is to preserve the reflecting surface and prevent unnecessary polishing, which often does more harm than good to finely polished surfaces. The lamp socket is permanently focused at the factory, and all the bulbs are standardized, so that should a bulb be worn out it is necessary only to withdraw the old bulb and replace it by a new one, when the focus will be found to be automatically correct. The bulb is held in its socket by a spring contact plate in the back of the lamp and connected to the outside terminal. It has a special hinge, the body of which is bored to receive the lamp bracket and a separate screw to fix the front in position. This screw can be slackened only, and so cannot be mislaid or lost.

In the case of the head lamps, the reflectors are carried in the body of the lamp. The bulbs are held in bayonet holders, but the holders are focused in the works, and all bulbs are standardized to focus correctly. A feature of the Bosch lamps reflectors is that they are designed to eliminate the usual thin and blinding shaft of light noticeable in some head lights. All light from the special filaments is massed and projected in a broad, diffused, penetrating light that casts to an exceptionally wide angle. Thus all turns and curves in the road are in full view.

Two methods of installing the generator, one by chain, and the other for belt drive are shown in Fig. 2. It is also suitable for mounting alongside the magneto.

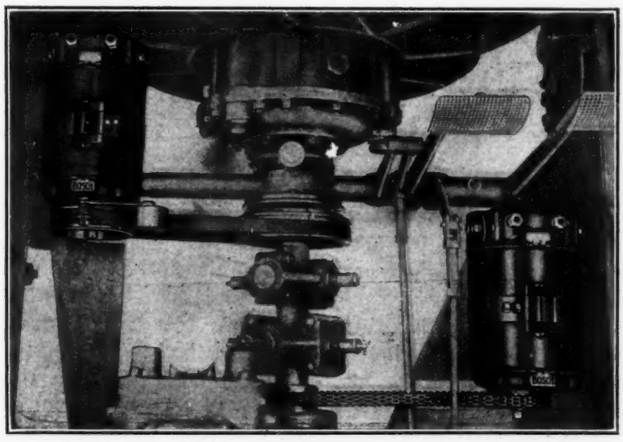


Fig. 2—Alternative methods of installing Bosch electric lighting generator

The Automobile

PUBLISHED WEEKLY

Vol. XXX Thursday, February 5, 1914 No. 6

THE CLASS JOURNAL COMPANY
H. M. Swetland, President
W. I. Ralph, Vice-President E. M. Corey, Treasurer
231-241 West 39th Street, New York City

BRANCH OFFICES
Chicago—910 South Michigan Avenue Detroit—505 Free Press Building
Boston—1035 Old South Building Cleveland—516-517 Swetland Building

EDITORIAL
David Beecroft, Directing Editor
Donald McLeod Lay J. Edward Schipper Sydney Oxberry
L. V. Spencer, Special Representative, Detroit

ADVERTISING
F. B. Barnett, Cleveland C. H. Gurnett, Chicago
L. G. Vogel, Detroit F. J. Robinson, Chicago

Cable Address ---------- Autoland, New York
Long Distance Telephone ---------- 2046 Bryant, New York

SUBSCRIPTION RATES
United States and Mexico ---------- One Year, $3.00
Other Countries in Postal Union, including Canada ---------- One Year, 5.00
To Subscribers—Do not send money by ordinary mail. Remit by Draft, Post-Office or Express Money Order, or Register your letter.

Entered at New York, N. Y., as second-class matter.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

Chicago's Business Show

LAST week's Coliseum show in Chicago, besides incidentally setting a new high-water record for attendance, has proven to the doubting Thomases that all interest in the automobile is not yet at an end, in spite of the fact that banks during the past fall raised the rate of interest to dealers who wanted to lay in stores of cars for ready spring shipment, and in other cities shut down on advancements to motor car dealers.

With an attendance of 30 per cent. increase over all previous shows and with over 1,000 more dealers present than ever before, and with more retail sales made than perhaps at any previous Chicago show, it is conservative to predict a good selling season.

The Chicago show has conclusively proven that there is ready money in all of the States of the Union, it has proven that buyers are more plentiful, and has also proven that the country is not yet filled with cars, but there exists a demand which gives promise of absorbing over 400,000 cars during the 1914 season.

The manner in which the show unfolded its army of new buyers, its brigades of interested dealers and its regiments of interested visitors dumbfounded many makers, who looked for a slow opening of business. It convinced them that during the past few months much of the so-called stringency has been largely subjective, existing only in the mind. It demonstrated that this great country is ready for a big 1914 season. From all states gathered hopeful dealers, who have already started an active selling season, and who predict that this year will establish a new sales record.

Forces That Buy

EVERYONE has noted and commented on the fact that the cheap cars, those selling at $1,500 and under, are generally better filled than the more expensive machines. Every country tour brings you face to face with cars, listing at under $1,000, which are just bubbling over with passengers. You think the tonneau walls will burst outwards. Women and children crowd every nook and corner of them. If the family of the owner is not equal to the capacity you find neighbors filling in the gap. At any rate, the empty seat is taboo. The car is filled, filled to overflowing, and everybody looks happy.

During these same tours you meet the higher-priced cars and the very high-priced ones. They are not so well filled. Often the chauffeur is alone in front, and in the back seat are two or three. There are seats for five, but how rarely are they well filled! Often the owner sits beside the chauffeur and the tonneau is empty. These people must have neighbors, but they are not with them. Perhaps the neighbors all have cars. In such a case the owner is not so fortunate as the owner of the cheaper car, who is blessed with neighbors, some of whom have not cars.

Why the difference? Why the bubbling over of passengers in one case and the scarcity in the other? Why the mixing of old and young more with the lower-priced car than in the higher-priced ones?

At the bottom often exists one of the strongest factors in car purchasing, namely, the holding-the-family-together argument. The car that carries the entire family is doing a magnificent work in the community. It is doing a work that sells cars to other families within which exist strong bonds of union. The families of the middle classes are generally larger than those of the wealthy, hence the better-filled cars. If the whole family could not have been taken along the car would not have been purchased.

Holding the family together is with many families one of the strongest arguments that can be advanced in these days when the divorce mill is grinding overtime. It is an argument that appeals. It is an argument that has sold thousands of cars and will continue to sell tens of thousands more, even if salesmen never mention it. Any force that makes stronger the family ties is bound to be a potent force; it is bound to be an enduring force. With the middle classes it is a very strong force. It is a force that has existed since the inception of the family, and will continue as long as the family circle continues to exist.

Not a New Selling Argument

The holding-the-family-together argument is not new in the motor selling field. It has been quietly and subconsciously used for years. Some companies have entirely failed to grasp its potency. Others have overlooked it entirely. With some, active use is being made of it. Whether used actively or not the force has been exerting itself, is exerting itself and will continue to exert itself. It has been a constant factor for good in the industry and one quite overlooked at the end of the year, when the forces which have been active are surveyed.

Laws of Gyroscope Discussed at S.A.E.

Gyroscopic Effect of the Flywheel in Automobiles

NEW YORK CITY, Jan. 30—Gyroscopes and their action on vehicles was the subject discussed at a meeting of the Metropolitan section of the Society of Automobile Engineers in the Automobile Club of America last night. The two principal speakers were E. P. Hopkins, who explained the gyroscopic action of his mono-rail system with working models, and Edward Durant, whose remarks consisted of an elementary exposition of the basic principles of the gyroscope.

The precessing movement peculiar to the gyroscope was explained by both speakers with the aid of models. This action, shown in the accompanying illustration, is the fundamental law of the gyroscope. If a wheel such as a bicycle wheel is held in a vertical position by one end of a shaft and spun it will be found that in order to maintain a vertical position it is necessary to move the axle radially around its point of support at a certain definite rate or precession. If this rate is increased by external means the outer end of the axle immediately raises itself. If the precession is retarded the free end drops. The effort in both cases is very strong and is the force used in the Brennan mono-rail system to support the car in an upright position. The direction of movement of the wheel in its orbit about the supporting point is dependent on the direction of rotation of the wheel as shown by the arrows in the illustration. The relation may be most easily remembered, as explained by Mr. Durant, by noting that the direction of the lower side of the spinning wheel agrees with that of the precessional orbit.

Effect of Flywheel in Automobiles

With regard to the practical application of gyroscope principles the point was raised as to the effect of the engine flywheel on automobiles and the propeller on aeroplanes. It was stated that only in a quick turn to one side or the other would any effect ensue. If on turning to the left the tendency would be to raise the front end of the car. A quick turn to the right would depress the front end. In the case of the aeroplane, in which this action is naturally of much more importance than in the automobile it has often been pointed out that the two-propeller machine has an advantage over the single screw machine, since the gyroscopic effect of one of the propellers neutralizes that of the other.

In the Brennan monocar two gyroscopes are carried so as to permit turning in either direction without upsetting. The wheels are arranged vertically so that the orbit of precession is parallel to the earth's surface. In the Hopkins design a model of which was run back and forth over a single rail track at the meeting, the wheel occupies a horizontal position.

Automobile Insurance Co. Shows Big Profit

NEW YORK CITY, Feb. 2.—The first annual statement of the Automobile Insurance Co., Hartford, Conn., presents a remarkable record for the company since it began business on July 1, 1913. The total assets are $693,983, with $530,000 invested in stocks and bonds. The total income for the period was $115,594 of which $106,883 came from premiums. The payments to policyholders were $3,667, and the surplus to policyholders amounts to $623,012.

The Automobile Insurance Co. is affiliated with the Aetna Life and the Aetna Accident & Liability Co., but this report is not included in the statements of the other companies.

Tells of Long Tour in Electric

NEW YORK CITY, Jan. 29.—The Electric Vehicle Assn. of America held a meeting last evening in the Engineering Building to hear addresses by Dr. C. P. Steinmetz, electrical engineer, and Colonel E. W. Bailey, manufacturer of the Bailey electric. Dr. Steinmetz predicted a brilliant future for the electric passenger vehicle, stating that the electric automobile is simple and can be run by a novice. He also stated that if the electric car is to forge ahead as a passenger vehicle two things are necessary: the constructing of a good cheap electric, corresponding to the Ford in the gasoline field, and the establishment of a chain of charging stations throughout the country.

Colonel Bailey told of his recent trip from New York to Chicago, describing the triumph of the electric over bad roads, hills and unfavorable weather conditions. His car averaged 17.8 miles an hour on the run, exclusive of long stops. The trip was made in 14 days, the longest day's run being over 170 miles.

A probable result of the meeting is the establishment of closer relations between the manufacturers of electric vehicles and lighting companies throughout the country, with a view to simplifying the charging problem.

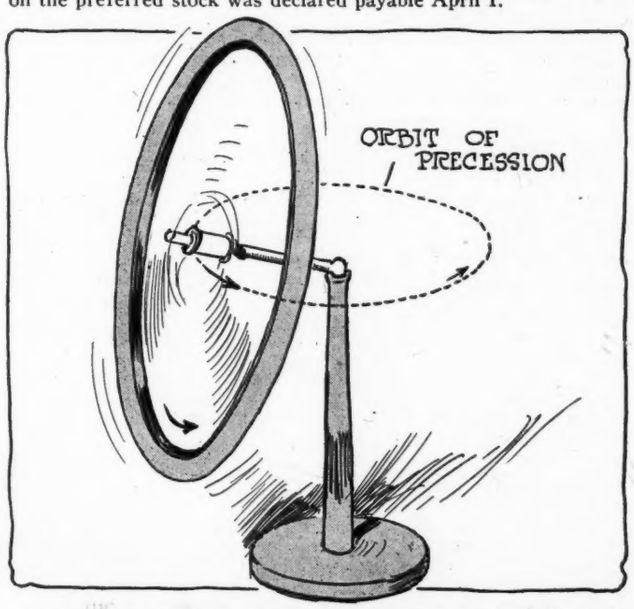
Callan Law Goes into Force in 1915

NEW YORK CITY, Feb. 2.—The provision in the present automobile law in New York which provides that a motor vehicle licensed for four consecutive years would afterward pay only one-half of the regular yearly fee will not become operative for another year. The Callan law, as this is known, was passed in the Legislature four years ago, but did not go into effect until August 1, 1910. Those taking out automobile licenses during the remainder of that year paid only one-half of the annual fee. Therefore there is no one to date who has paid four full years' license fees on a motor vehicle, and consequently no one who has licensed a motor vehicle for four consecutive years under the Callan law. This has been brought to the attention of Secretary of State May, and he has decided that this license provision does not apply to this year.

Indianapolis Opens Municipal Garage

INDIANAPOLIS, IND., Feb. 2—The city, today, opened a municipal garage, the first, it is believed, in Indiana, and one of the few in the middle west. The board of public works, which will have control of the garage, believes it will save the city thousands of dollars annually. The garage will be used to house all city motor cars, except those in the police and fire departments, at night and on Sunday. Expert mechanics are to be employed. Supplies will be bought in large quantities. The board is now advertising for bids for 10,000 gallons of gasoline. The garage building cost $9,000.

NEW YORK CITY, Feb. 2.—At a meeting of the board of directors of the B. F. Goodrich Co. a dividend of 1¾ per cent. on the preferred stock was declared payable April 1.



The wheel and axle of a gyroscope move as a whole around their point of support in a direction depending on the direction of rotation of the wheel, as shown by the arrows above. This movement is called precession

Weed and Parsons Sue Donnelly Co.

Rudge-Whitworth To Aid Houk Company—Isotta Answers Fiat

NEW YORK CITY, Feb. 3—The Parsons Non-Skid Co., Ltd., the Weed Chain Tire Grip Co., and H. D. Weed have brought suit in the United States District Court in the Southern District of New York, against the Walker Tire Chain Co. and R. F. Ely, doing business under the name of Donnelly Motor Equipment Co.

The complainants claim a direct infringement on their patent Number 723,299, the bone of contention being known as the Walker anti-skid non-creeping tire chain. The Weed faction asks for a writ of injunction.

Judge Coxe said in his recent decision against the E. J. Willis Co. and in favor of the Weed company that it could hardly be expected with such an unbroken current of authority in favor of the patent, that this court would discard its former decision and hold the Parsons patent invalid unless new and cogent proof were presented, which would convince that the long array of prior decisions had been erroneous.

In the Weed vs. H. R. Johnson case in Milwaukee, Wis., the Pioneer chain was held to infringe the Parsons Non-Skid patent. The chain in the suit was provided with an extra piece to fasten around the felloe, thus holding the tread chains so that they could not creep. The contention of the defense was that if a chain were so anchored that it would not creep, it did not come within the purview of the Parson patent. The complainant argued that such a chain would so injure tires that the purchasers of the non-creeping chain would not affix the anchoring chains, with the result that the chain would creep.

Isotta-Fraschini Answers Fiat Co.

NEW YORK CITY, Feb. 3—The Isotta-Fraschini Motors Co. has filed an answer in the U. S. District Court for the Southern District of New York to the complaint brought against it by the Fiat company, Poughkeepsie, involving an alleged infringement of patent Number 979,278, issued to Guido Fornaca. This patent covers certain improvements in vehicle frame suspension. The defendant admits that the patent was issued, but that it was unlawfully issued to Fornaca, claiming that the patent is void because Fornaca was not the first inventor of the patent. It named about twelve people using same prior to his invention and about eleven patents, issued prior to his invention.

There is another suit up in this court in which the same companies hold their respective positions of complainant and defendant. In this suit the Fiat company claims an infringement on its yoke construction, Number 1,050,049.

Adamson Vulcanizer Patent Valid

EAST PALESTINE, O., Jan. 30—On January 16, after a vigorous defense offered at a final hearing in open Court in the U. S. District Court for the Eastern District of Missouri, in a suit brought under the Adamson Basic Patent Number 1,057,911, against the Gilliland Auto Supply Co., St. Louis, Mo., Judge Dyer, U. S. District Judge, declared the Adamson patent to be valid in every particular, and signed a decree granting a permanent injunction and an accounting against the Gilliland Auto Supply Co.

This decision covers vulcanizers constructed to retain a combustible fluid which is heated simultaneously with the vulcanizer by the combustion of the fluid, thereby automatically controlling the temperature.

Rudge-Whitworth To Co-Operate With Houk

BUFFALO, N. Y., Feb. 3—*Special Telegram*—Cable advices just received by the Houk Mfg. Co., from Liverpool, England, give assurance of the co-operation of the Rudge-Whitworth Co., of England, in adjusting the alleged differences of the Standard Roller Bearing Co., Philadelphia, against the Houk Mfg. Co.

Some of these differences were recently aired in several of the automobile publications.

It now develops that the Houk company is joint licensee with the Standard Roller Bearing Co., in the license, granted October 5, 1912, by the Rudge-Whitworth Co., for the manufacture in this country of wire wheels covered by their patents.

George W. Houk, president of the Houk Mfg. Co., recently brought out the Houk wire wheel, embodying in its construction all of the features controlled by the Rudge-Whitworth Co., which were deemed necessary to good wire wheel construction.

It was the acceptance of the Houk wheel by the British company under its contract with the Houk company that prompted Mr. Houk's trip to England about 2 weeks ago to demonstrate to the British manufacturers the various features of his modified construction.

Mr. Houk is returning on the Lusitania which sailed February 1, and has advised his Buffalo company to rush to completion additional facilities for again greatly increasing its capacity.

The Houk Mfg. Co. prepared itself some time ago to take care of any quantities of wire wheels that it might be called upon to deliver.

Krit Sales Company Formed

DETROIT, MICH., Feb. 2—To assist the Krit Motor Car Co. to properly swing its manufacturing during the usual dull winter period between the time of bringing out of new models and that of the incoming of cash due to greater spring sales, the creditors have further come to the front in forming the Krit Sales Co., with a capital of $100,000, the object of which is to secure the parts and materials and to give its check for the pay-roll. The sales company has for its head H. W. Standard, Northern Engineering Works, who has been president of the Krit Motor Car Co., since the creditors' agreement was entered into last summer. The other officers of the sales company are W. S. Russell, Russell Wheel & Foundry Co., vice-president (Mr. Russell is also a director of the Krit manufacturing business); F. W. Blair, Union Trust Co.; A. W. Russell, Russell Motor Axle Co.; J. J. Ramsey, A. C. Knapp Co. (Mr. Ramsey is a director of the Krit Motor Car Co. also).

Automobile Securities Quotations

No changes of any importance took place in this week's securities quotations. General Motors common rose 18 points. The common and preferred of the Kelly-Springfield tire rose respectively 7 and 5 points. Goodyear common dropped 5 points.

	1913 Bid	1913 Asked	1914 Bid	1914 Asked
Ajax-Grieb Rubber Co., com	165	185	200	..
Ajax-Grieb Rubber Co., pfd	95	100	98	101
Aluminum Castings, pfd	98	100	97	100
Chalmers Motor Company, com	..	..	..	92
Chalmers Motor Company, pfd	..	..	93	94½
Firestone Tire & Rubber Co., com	355	362	246	252
Firestone Tire & Rubber Co., pfd	106	108	105	107
Garford Company, preferred	105	107	80	90
General Motors Company, com	34	35	63	65
General Motors Company, pfd	78	79	86	88
B. F. Goodrich Company, com	62½	63½	25	26
B. F. Goodrich Company, pfd	103¾	104¼	89	91
Goodyear Tire & Rubber Co., com	460	470	220	230
Goodyear Tire & Rubber Co., pfd	104	105	100	102
Gray & Davis Co., preferred	..	..	90	97
Hayes Manufacturing Company	..	90	..	..
International Motor Co., com	5	15	..	5
International Motor Co., pfd	25	40	..	15
Kelly-Springfield Tire Co., com	23	25	59	60
Kelly-Springfield Tire Co., pfd	70	80	126	128
Kelly-Springfield Motor Truck Co., com	..	..	40	60
Kelly-Springfield Motor Truck Co., pfd	..	..	90	105
Lozier Motor Company, com	..	..	..	15
Lozier Motor Company, pfd	..	..	..	65
Maxwell Motor Company, com	..	..	4½	5
Maxwell Motor Company, 1st pfd	..	..	26½	27½
Maxwell Motor Company, 2nd pfd	..	..	8	8½
Miller Rubber Company	195	200	124	130
New Departure Mfg. Co., com	..	..	120	125
New Departure Mfg. Co., pfd	..	..	102	104
Packard Motor Company, pfd	103	105	95	99
Palmer & Singer, pfd	..	..	..	65
Peerless Motor Company, com	..	..	15	25
Peerless Motor Company, pfd	..	..	75	80
Pope Manufacturing Co., com	30	32	1	2
Pope Manufacturing Co., pfd	77½	79½	8	12
Portage Rubber Co., com	..	..	..	40
Portage Rubber Co., pfd	..	..	..	90
Reo Motor Truck Company	11½	12¼	7	7½
Reo Motor Car Company	20½	21¼	16	16½
Rubber Goods Mfg. Co., pfd	105	108	105	115
Russell Motor Car Co., com	..	..	..	40
Russell Motor Car Co., pfd	..	..	..	90
Splitdorf Electric Co., pfd	..	..	40	50
Stewart-Warner Speedometer Co., com	..	..	52	54
Stewart-Warner Speedometer Co., pfd	..	..	96½	..
Studebaker Company, com	34	35	27	28
Studebaker Company, pfd	92	93	82	85
Swinehart Tire Company	104	105½	69	71
U. S. Rubber Co., com	..	..	59½	60
U. S. Rubber Co., 1st preferred	..	..	102	102½
Vacuum Oil Co	..	..	213	216
White Company, preferred	105	108	105	110
Willys-Overland Co., com	69½	70¼	62	64
Willys-Overland Co., pfd	98¼	99¼	91	95

Goodrich Profits for 1913—$2,600,000

G. M. Receipts Increase 14 Per Cent.—Buick Has $4,000,000 Cash

NEW YORK CITY, Feb. 2.—The B. F. Goodrich Co. makes the following preliminary statement of earnings in 1913: The books of the B. F. Goodrich Co. have been closed for the purpose of compiling the full annual report for the year 1913. The results are approximately as follows, subject only to the verification of public accountants and auditors.

The profits for the year, as shown by the annual report, will be approximately $2,600,000, after proper allowances for maintenance, depreciation and other items which it was deemed conservative to take out of earnings for the year. This result added to the surplus carried over on December 31, 1912, shows undivided profits of approximately $700,000, after payment of the full year's dividends on the preferred stock and 1 per cent. on the common stock.

The financial position of the company has been materially strengthened during the year. The quick assets as of December 31 were approximately $20,000,000, against current liabilities of $4,000,000, so that the quick assets are now five times the current liabilities. The last annual report showed a ratio of about three to one. The company has no funded debt and no need for any new financing.

General Motors Cash Receipts Increase 14 Per Cent.

NEW YORK CITY, Feb. 2—During the five and a half months up to January 15 the General Motors Co. cash receipts from sales totaled $34,764,679, against $30,533,361 in the same period of 1913, an increase of $4,231,318, or 14 per cent. During December and so far in January sales have been averaging about the same or slightly less than a year ago. Current billings are about $1,500,000 per week. From August 1 up to January 21 the company has made 27,387 cars and sold and received cash for 26,368 cars, so it has accumulated so far this season only 1,000 cars to meet the spring demand.

Buick Has Nearly $4,000,000 Cash

NEW YORK CITY, Feb. 2.—The balance sheet of the Buick Co., as of December 31 last, shows cash on hand of $3,945,271, real estate $153,853, goods, material, merchandise, etc., $4,247,783, stocks in other companies $516,400, capital stock $2,500,000, unsecured indebtedness $3,943,700.

Republic Rubber to Increase Capital

NEW YORK CITY, Feb. 2.—At the annual meeting of the Republic Rubber Co. the stockholders voted to increase the capitalization of the company to enable an increase in its output capacity. The amount of the increase in the stock has not been determined as yet. A preliminary resolution was passed, providing for the retirement of $2,500,000 of preferred stock and refunding it under the new issue.

Wilcox to Enlarge Truck Output

MINNEAPOLIS, MINN., Jan. 31.—The H. E. Wilcox Motor Co., to enlarge its output and distribution, is offering, subject to prior sale $500,000 of its 7 per cent. cumulative preferred stock in $100 shares. The company has manufactured Wilcox trucks several years. Of the output, 66⅔ per cent. are repeat orders. The company in November absorbed the H. E. Wilcox Motor Car Co. and the Minneapolis Motor Co., which manufactured Minneapolis tri-cars and motorcycles. It was decided then to increase the output of Wilcox cars and to enlarge the branch selling plants and to add new selling agencies in the United States and Canada.

U. S. Rubber Will Show Big Increase

NEW YORK CITY, Feb. 2.—For the nine months to December 31, the period which the forthcoming annual statement of the United States Rubber Co. will cover, the company will show a surplus above the dividend on the common stock proportionally as large as the $1,744,000 earned in the twelve months to March 31, 1913.

Up to the first or middle of November the tire business of the company was making a remarkable gain over the previous year. The percentage of increase was 27 per cent. But the last six weeks of the year saw a marked decrease in demand for tires, with the result that the full nine months witnessed a gain of 19 per cent. in tire sales.

Franklin Elects Officers and Directors

SYRACUSE, N. Y., Jan. 31.—The annual meeting of the stockholders of the H. H. Franklin Mfg. Co. was held January 28, and the following directors were elected: Herbert H. Franklin, John Wilkinson, Frank A. Barton, Giles H. Stillwell, Arthur Holmes, E. H. Dann, Alexander T. Brown and W. C. Lipe. The officers of the company elected are H. H. Franklin, president; John Wilkinson, vice-president, and F. A. Barton, secretary and treasurer.

The annual meeting of the stockholders of the Franklin Automobile Co. was held at the same time and the following directors chosen: H. H. Franklin, John Wilkinson, F. A. Barton, Arthur Holmes and E. H. Dann. The officers elected were H. H. Franklin, president; Arthur Holmes, vice-president, and F. A. Barton, secretary and treasurer.

Cancels Dunnage Allowance of 500 Pounds

NEW YORK CITY, Feb. 2.—The Southwestern tariff committee has cancelled the allowance of 500 lbs. for dunnage on shipments to the Southwest, and this having been protested by this department and other shipping interests, the Interstate Commerce Commission has suspended the tariff and continued the allowance pending investigation.

The commission has notified the general traffic department of the Automobile Chamber of Commerce that this matter is assigned for hearing at the Federal Bldg., Chicago, before examiner Gibson, 10 a. m. February 9. This investigation will undoubtedly determine the propriety of dunnage allowances.

MARSHALLTOWN, IA., Feb. 2—At the annual meeting of the V-Ray Co., the capital stock, paid-up, was trebled. D. H. Denmead acquired one-third interest in the company, Mr. Sinclair and Mr. Hansen owning a third interest, respectively.

The following officers were elected: V. N. Hansen, president; B. W. Sinclair, vice-president and D. H. Denmead, secretary-treasurer.

Market Changes of the Week

This week's market saw the usual changes. Tin rose $0.98 and Bessemer and Open-Hearth steel both rose $1.00. Petroleum from Kansas, closed at $1.05 a barrel, at a gain of $0.02. Fine Up-River Para dropped $0.02. Cottonseed oil rose $0.09. Both electrolytic and Lake coppers rose, the former $0.00 5-20 and the latter $0.00 1-4 a pound.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Changes
Antimony	.06	.06	.06	.06	.06	.06	.....
Beams & Channels, 100 lbs.	1.31	1.31	1.31	1.31	1.31	1.31	.....
Bessemer Steel, ton	19.00	19.00	20.00	20.00	20.00	20.00	+1.00
Copper, Elec., lb.	.14 9/20	.14⅜	.14½	.14⅜	.14 7/10	.14 7/10	+ .00 5/20
Copper, Lake, lb.	.14⅝	.14⅝	.14⅝	.14⅝	.14⅞	.14⅞	+ .00¼
Cottonseed Oil, bbl.	7.00	7.12	7.10	7.10	7.09	7.09	+ .09
Cyanide Potash, lb.	.17	.17	.17	.17	.17	.17	.....
Fish Oil, Menhaden, Brown	.40	.40	.40	.40	.40	.40	.....
Gasoline, Auto, bbl.	.16	.16	.16	.16	.16	.16	.....
Lard Oil, prime	.93	.93	.93	.93	.93	.93	.....
Lead, 100 lbs.	4.07½	4.07½	4.07½	4.07½	4.10	4.13	+ .05½
Linseed Oil	.52	.52	.52	.52	.52	.52	.....
Open-Hearth Steel, ton	19.00	19.00	20.00	20.00	20.00	20.00	+1.00
Petroleum, Kans. crude, bbl.	1.03	1.03	1.03	1.03	1.03	1.05	+ .02
Petroleum, bbl., Pa., crude	2.50	2.50	2.50	2.50	2.50	2.50	.....
Rapeseed Oil, refined	.59	.59	.59	.59	.59	.59	.....
Rubber, Fine Up-River, Para	.77	.75	.76	.76	.76	.75	— .02
Silk, raw Italy	....	5.15	....	....	5.15	5.15	.....
Silk, raw Japan	....	4.20	....	....	4.25	4.20	.....
Sulphuric Acid, 60 Baume	.90	.90	.90	.90	.90	.90	.....
Tin, 100 lb.	39.40	38.85	39.90	40.13	40.55	40.38	+ .98
Tire Scrap	.04½	.04½	.04½	.04½	.04½	.04½	.....

Willys-Overland beefsteak dinner at the Hotel La Salle, Chicago, at which there were 450 dealers

Will Continue Making R-C-H Cars

C. P. Seider Buys Plant and Will Assemble Cars Under Name of R-C-H-Corp.—Same General Design

DETROIT, MICH., Feb. 3—The sale of a large portion of the assets of the R-C-H Corporation, by the Todd, Frank, Friedberg Co., which bid the entire property in at receiver's sale some time ago, to C. P. Seider, of Detroit, was closed today. A. H. Collins, former distributor of R-C-H cars, is associated with Mr. Seider. This means that the R-C-H name will again go on motor cars and further that the business will be continued under the name of the R-C-H Corp. Mr. Seider has bought practically outright everything pertaining to the assembly of the machines, including buildings, real estate, etc. His interests, however, did not take over the foundry, machine shop nor the forge plant, and these are still being offered for sale by the Todd, Frank, Friedberg Co.

Mr. Seider stated today that it was too early yet to make any statements as to manufacturing plans, although it is the intention to assemble the cars principally. In all probability the machine will be continued with the same general design as heretofore, although a new type has been considered somewhat. The purchaser could not at this early date say just how many cars would be made during the coming year.

Matheson Affairs Now Closed

NEW YORK CITY, Feb. 2.—W. C. Shepherd, who was appointed receiver of the Matheson Motor Car Co., of Wilkes-Barre, Pa., when the company went into bankruptcy over a year ago, has made his final report to the United States District Court. In this he sets forth that the business of the concern is now closed and that he has distributed a total of $188,342.29 among the creditors of the company. Just what percentage of his claims each creditor received is not set forth by Mr. Shepherd. The report will be taken up by Judge C. B. Witmer.

Association of Spark Plug Manufacturers Formed

CHICAGO, ILL., Jan. 29.—Seventeen makers of spark plugs of the thirty-five licensed under the Canfield patent met this afternoon at the Congress Hotel Annex and formed the Association of Spark Plug Manufacturers, elected officers and a committee and discussed the policy of the organization. It was pointed out that there were makers of spark plugs and parts who were not doing justice to the industry or who were making profit and not satisfaction to the consumer their policy. The association decided upon a definite policy, which is part of the constitution and reads as follows:

"To foster the interests of those engaged in the trade or business of manufacturing spark plugs or parts thereof.

"To procure uniformity and certainty in the customs and usages of such trade or business.

"To reform abuses relative to such trade or business.

"To secure freedom of its members from unjust or unlawful exactions.

"To diffuse accurate and reliable information as to the standing of merchants and others dealing with the members, and as to the condition and development of the trade or business in which the members are engaged in the United States.

"To advocate the enactment of just and equitable laws affecting the members.

"To settle differences between the members.

"To promote a more enlarged and friendly intercourse among the members."

After the reading of the constitution a secretary and treasurer were elected, J. W. Fisher, of the Silvex Co., taking the first named office and A. R. Mosler the second. A committee of five was selected, whose duties will be to investigate and report on all matters relating to the spark plug industry and to bring to the notice of the association all infringers of the Canfield patent, those who are conducting their business on a false basis or, in other words, misrepresenting their products, and those who are in any way harmful to either the industry or the consumer's welfare. The committee is composed of R. E. Mills, of the Rajah Co.; R. A. Stranahan, of the Champion Spark Plug Co.; Albert Champion, of the Champion Ignition Co.; Emil Grossman, of the Emil Grossman Mfg. Co., and E. M. Benford, of the Benford Mfg. Co. Mr. Benford was elected chairman of the committee, with the power to set the date for the annual meeting in January.

The principal office of the association is located in New York. Any individual, firm or corporation actually engaged in making spark plugs or parts shall be eligible to membership in the association, the annual dues for each member being set at $25. The signing of the constitution and the payment of dues represents approval of membership.

Walpole Receivers Get Allowance

BOSTON, MASS., Jan. 29.—Judge Dodge, of the United States District Court, has allowed R. O. Harris and R. C. Fisher receivers of the Walpole Tire & Rubber Co. $6,000 each as an allowance on account. The same sum has been allowed for counsel fees. The receivers have had charge of the property over six months. Mr. Harris requested an allowance of $10,000.

Judge Dodge ordered decrees to be entered approving the receivers' recommendations for allowance of claims rising to $500,000, and that certain claims be transferred from the disallowance class to those to be heard before a master. The master's hearing will start immediately.

The next hearing will be held February 14, instead of February 7.

Overland 1915 Output To Be 75,000

CHICAGO, ILL., Jan. 29.—An output of 75,000 cars for 1915 was announced last night at the Willys-Overland dinner held at the Hotel La Salle and which brought out more than 450 Overland agents. John N. Willys was most optimistic as to the business prospects of the present year, and in a well phrased speech he

aroused his dealers to great enthusiasm over future prospects.

A general laugh was raised in the course of Mr. Willys' speech by the repartee of one of the dealers. Mr. Willys was telling of an Overland salesman out in California who blamed continuous rains for his failure to turn in orders. The factory sent him a rather sharp letter calling attention to the fact that orders and not excuses must be sent in. "How do you expect us to meet a weekly pay roll of $150,000 with promises?" he was asked.

"Pay 'em in rain checks," flashed the wit in the audience, and this joke gave Mr. Willys several opportunities to demonstrate his own wit during the course of his speech.

Isaac N. Kinsey, vice-president of the Overland company, followed Mr. Willys and he held the attention of his big audience by telling of how he became identified with Mr. Willys, first by giving him credit for parts when the Overland chief first started his sensational fight for recognition. David Beecroft, Directing Editor of THE AUTOMOBILE, was the other speaker of the evening, outlining the brilliant prospects of the year. Following the speeches there was a vaudeville program run off.

—

Brisbane Talks to Maxwell Dealers

CHICAGO, ILL., Jan. 29.—At tonight's dinner given to 120 of its dealers by the Maxwell Motor Co., President Walter E. Flanders told of the increased production and the inability to supply the entire demands of the dealers, pointed to a certain shortage of cars by the opening of Spring. Eugene Meyers, Jr., of New York, representing the financial interests back of the organization, outlined the spirit of confidence that the financial backers have in the new organization and spoke of the advancement of additional capital as needed to take care of the increased production.

Arthur Brisbane, the guest of the evening, spoke to the dealers on selling arguments that sell $750 cars. He referred to the 60,000 people in the country who have salaries of $15,000 and over and predicted that these would generally be buyers of medium and low-priced cars because they had had to work to earn their money and consequently were not going to be rash in expending it, so that while the high-priced car maker counted this army of wage earners in his selling field, he predicted the small car as being the biggest seller to them.

—

To Buy Up Bankrupt Companies

DETROIT, MICH., Feb. 2—A new $50,000 company has been formed in Detroit for the purpose of buying up concerns in the automobile field which have become bankrupt. The company is incorporated under the name of the Auto Stock Co. and the chief stockholder is Mansell Hackett, of London, England, who recently bought the Disco Co. Mr. Hackett states, however, that the new concern is entirely distinct from his interests in the Disco Co.

—

Magneto Makers Offer Race Prizes

NEW YORK CITY, Feb. 2.—In keeping with its usual practice of encouraging drivers taking part in the big automobile contests, the Bosch Magneto Co., of New York, will set aside $1,900 for the two big automobile races to be held at Santa Monica, Cal., February 21 and 23. By division of the prizes each driver has an opportunity to win cash prizes in addition to the promoters' regular purse, if he is successful in gaining either the first, second or third position. The distribution of the Bosch prizes is as follows:

To the winner of the Grand Prize Race, $500; to the driver of the second car, $150; to the driver of the third car, $100. The only condition to these prizes is that the driver in each instance use a Bosch magneto for ignition purposes during the race.

In the case of the Vanderbilt Cup Race, the winner of the first prize receives a Bosch prize of $300; to the driver of the second car $150 will be awarded, and to the driver of the third car $100. The condition is the same as in the Grand Prize Race. A second set of prizes has been arranged for the drivers in case they use during the race Bosch plugs in addition to Bosch magnetos. In each case where the equipment is completely Bosch, the driver, if first second or third, is to be awarded $100. Thus for the first time the Bosch Magneto Co. will award to those drivers who are successful an additional prize for using its plugs. The six plug awards amount in all to $600 additional.

—

Burman Enters Two Cars for Indianapolis

INDIANAPOLIS, IND., Feb. 2.—Bob Burman has formally entered two Centipede cars for the 500-mile race to be held at the Indianapolis Motor Speedway, May 30. He is backed by Horace Thompson, of Battle Creek, Mich., who, with the entry of the Centipedes, has withdrawn the Anel entry, made some time ago. There are now six official entries, the others being two Stutz, a Fox and a Beaver Bullet.

The piston displacement of the Centipedes will be 449.43 cubic inches, barely under the maximum of 450 cubic inches. The bore will be 5.4 and the stroke 5.5. Sixteen overhead valves give the cars their name. Burman is to drive one of the cars, but the driver for the second has not been nominated. One of the Centipedes will be allotted No. 1, which was the number held by the Anel which has been withdrawn; the second Centipede will be given No. 17, the number held by the Anel in last year's race.

—

Ocean, Lake and Mountain Tour Planned

NEW YORK CITY, Feb. 3—Plans are under way for a tour to be held the latter part of April and the first of May, which will cover about fourteen cities, Senator Morgan, Edward Korbel and E. L. Ferguson are managing the run.

It will be called the Ocean Lakes and Mountain Tour and its itinerary will include Philadelphia, Baltimore, Washington, Pittsburgh, Cleveland, Cincinnati, Chicago, Buffalo, Rochester, Syracuse, Springfield, Boston, Hartford, Bridgeport and ending up at New York City.

It will be a sociability run without any contest rules and the various clubs in the cities visited will take part in the run.

—

Officials for Big Races Appointed

NEW YORK CITY, Feb. 3—The following officials for the Vanderbilt Cup Race: Referee, G. P. Bullard, attorney-general for the State of Arizona and founder of the Los Angeles to Phoenix Road Race; judges, A. B. Daniels, C. H. Cobb, and J. F. McLain; chief scorer, E. W. Leslie; technical committee, W. E. Bush, C. F. Smith and F. W. Young; starter, F. J. Wagner.

Practice hours for the Vanderbilt Cup and the International Grand Prize races have been scheduled for 6 to 8 a. m., commencing February 13 up to the 19th.

Banquet of Maxwell dealers held at Chicago during the automobile show

Members of the Oldsmobile Pioneers Association, which was formed at a banquet at the Congress hotel in Chicago during the show

Chicago Show Business Country's Largest

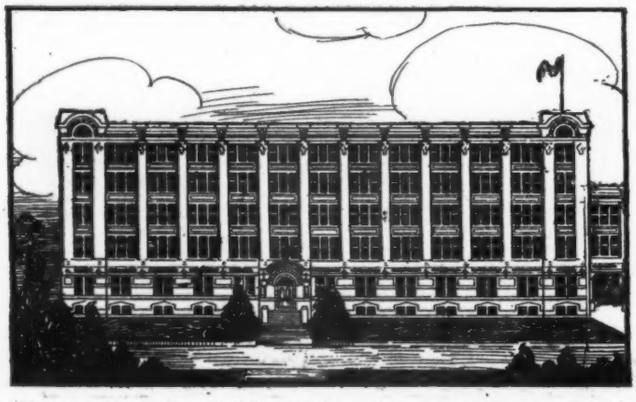
CHICAGO, ILL., Feb. 2—From a business standpoint the Chicago show which closed Saturday night, excelled any similar exhibition ever held in this country. The particular impressive point about last week's show was the attendance on the part of the dealers, more than 4,000 registering with manager Miles, whereas last year only 3,000 agents were here. Naturally with so much buying strength the exhibitors of cars could not help doing a record business, while the accessory people naturally profited also by the big attendance of the dealers.

As a matter of fact the attendance of the dealers was the real feature of the week, for it is the agent and not the consumer that appeals to the exhibitor. Retail business at the show was good, but the wholesale end of the week brought returns which will make the fourteenth annual show stand out head and shoulders above its predecessors. Possibly every state in the union was represented and there were dealers here from several foreign countries. Last year the dealers' attendance was placed at 3,000 but Friday morning Manager Miles was informed that the supply of 4,000 buttons provided for dealers had been exhausted and it was necessary to rustle around and pick up a few hundred more.

That these dealers came to buy was brought out strongly in the reports from some of the stands. Buick, for instance, figures that it sold 2,000 cars during the week, of course mostly all wholesale. Jeffery picked up orders for more than 1,000 in one night—when the banquet was given the agents Thursday night and they were warned that the factory was swamped with orders and that the laggards would have hard work getting cars if they waited until spring. Overland, Reo, Hupmobile, Studebaker, Maxwell and others also reported big orders from their dealers.

In a retail way the exhibitors did better than usual. Usually retail sales at national shows are few and far between. Those that do buy usually have been approached before the show and practically clinched, but last week there were many induced to put their signatures on the dotted line who had been developed as a result of the show. This applied more to the makers of popular priced cars because with the high priced brigade it is a difficult matter indeed to clinch sales at the show. Your moneyed man goes to look over the new cars and then tells the car's representative to call at his office later on to go into details.

A canvass of some of the booths the latter part of the week developed the fact that the industry as a whole is most enthusiastic over the results.



New administration building of New Departure Mfg. Co., Bristol, Conn.

Oldsmobile Pioneers' Association Formed

CHICAGO, ILL., Jan. 31—The Oldsmobile Pioneers' Assn. was formed last night at a banquet held at the Congress Hotel, more than sixty being present. Only those who were identified with the Olds Motor Works of Lansing, Mich., prior to 1905 are eligible to membership, and this brought out such prominent men as Roy D. Chapin, Howard Coffin, E. Bezner now of the Hudson company; George W. Dunham of the Chalmers, W. E. Metzger and many others. Fred L. Smith, former president of the Olds Motor Works was made president of the veterans' organization, while other offices were handed out to Charles B. Wilson and John G. Utz.

Exide Dinner a Success

CHICAGO, ILL., Jan. 29.—In accordance with its custom of 6 years' standing, the Electric Storage Battery Co., Philadelphia, tendered its seventh annual exide dinner to the electric vehicle manufacturers, dealers and exide battery distributors from all parts of the country at the Mid Day Club last night. Two hundred and fifty guests were in attendance.

Six-Cylinder Dealers Get Together

CHICAGO, ILL., Jan. 30.—Louis Geyler, the Chicago Hudson dealer, conceived the idea of entertaining the other six-cylinder dealers of the city with the view of fostering a spirit of co-operation and good fellowship. Last night he carried out the idea and gave a dinner to these forces at the Chicago Athletic Association. That the scheme was a good one is attested to by the fact that in spite of the many conflicting affairs in this busy week half a dozen six-cylinder car dealers were the guests of the Hudson forces, to say nothing of the members of the press and other guests, bringing the gathering up to about thirty.

As a result of his talk a motion was carried advocating the holding of similar six-cylinder meetings monthly.

New Departure Has New Quarters

BRISTOL, CONN., Feb. 2.—The New Departure Mfg. Co., of Bristol, will shortly occupy its large and handsome administration building, which has been in the course of erection for the past twelve months. It is 62 feet wide, 220 feet long and six

stories high, including the basement. The building is modern in every detail of construction and absolutely fireproof. The office is located on the fifth floor. An electric elevator of the latest type runs from the lobby of the building to the lobby of the office. At the front and south side are located the private offices of the officials and heads of departments. At the west side is a double fire and burglar-proof vault of two stories. All equipment in this vault is steel and absolutely fireproof. A feature of the main office is the large leaded glass dome ceiling light, running 112 feet long and 16 feet wide.

The remainder of the building will be occupied principally in the inspecting and assembling of the company's product. The first floor will be given over entirely to shipping and receiving.

Light Rim Brought Out by Goodyear

The Goodyear Tire & Rubber Co. announces a new quick-detachable and demountable rim for No-Rim-Cut tires that is noteworthy because of its lightness, being 10 pounds lighter than the average rim it is claimed. Only one flange ring is provided, this acting both as a locking ring and supporting flange.

The new rim is made in both quick detachable and quick detachable demountable styles. Besides these the company is making the Ideal rim for heavy cars. This is a double ring construction and is made for both plain and demountable rims.

150 Dealers Attend Chalmers' Dinner

CHICAGO, ILL., Jan. 30.—At previous shows the attendance at the Chalmers agents' dinners usually ran about forty or fifty, but at the affair given last night at the Congress more than 150 dealers from this section of the country gathered to listen to eulogies on six-cylinders which were brought out by Hugh Chalmers, who filled a rôle novel to him—that of toastmaster.

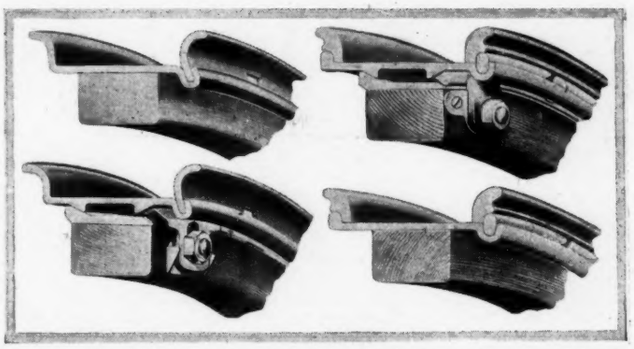
Dealers Order 1,011 Jeffery Cars for 1915

CHICAGO, ILL., Jan. 30.—When brought face to face with the fact that the output has practically been sold and that those who did not get into the band wagon right now probably would have a hard time getting cars at any price a little later this year, the 150 dealers present at the Jeffery banquet at the Congress last night got together and filed specifications and orders for 1,011 Jeffery cars. This is in excess of 1914 orders which they already had placed. A. M. Robbins, Chicago dealer, ordered 143 additional cars.

Knight Interests in Conference

CHICAGO, ILL., Jan 29—Licensees of the Knight motor patents took advantage of the opportunity offered by the Chicago show to hold a conference at the Auditorium yesterday. The meeting was attended by officials of the parent Knight company and of eleven of the concerns using the sleeve motor. Among the concerns represented were: the F. B. Stearns Co., The Moline Automobile Co., Knight & Kilbourne Patents Co., Willys-Overland Co., Lyons Atlas Co. and Roger B. McMullen.

Charles Y. Knight, in the chief talk of the conference, stated his belief that more progress had been made during the past year in the development and commercial growth of the sleeve-valve motor than has occurred during the previous 5 years. He referred especially to the introduction of the sleeve-valve motor into the omnibus field in the buses of the London General Omnibus Co., in England, where, he stated, they have scored success after success over their poppet valve predecessors upon practically every important point.



Upper left—New Goodyear No-Rim-Cut detachable rim. Lower left—Same with demountable feature. Upper right—Goodyear Ideal detachable demountable rim. Lower right—Detachable rim

E. V. A. A. Standardizes Charging Plug

NEW YORK CITY, Jan. 31.—The Electric Vehicle Association of America has a standardized charging plug and receptacle in both the 50 and 150-ampere sizes. The polarity is a special, the outside contact being positive and the inside contact being negative. The association urges the adoption of this plug and the receptacle by manufacturers and users.

NEW YORK CITY, Feb. 3—The directors of the Studebaker Corp., have declared the regular quarterly dividend of 1 3-4 per cent. on the preferred stock, payable March 1.

Carter Develops 40 H. P. at 1,500 R. P. M.

NEW YORK CITY, Jan. 31.—In THE AUTOMOBILE for January 29 it was stated that the Carter motor develops 40 horsepower on the block at 3,300 revolutions per minute. This was an error, as 3,300 revolutions per minute is the maximum speed of the motor. The motor develops 40 horsepower at 1,500 revolutions per minute.

Stewart Makes Only 1500-Pound Wagon

NEW YORK CITY, Jan. 31.—On page 277 of THE AUTOMOBILE for January 22 it was stated that the Stewart Motor Corp., Buffalo, N. Y., had added a 1-ton truck to its line. This was a mis-statement, as the Stewart corporation builds only a 1500-pound chassis.

Lexington Equipped With Collins Curtains

NEW YORK CITY, Feb. 4—In THE AUTOMOBILE for January 29, it was stated that the Lexington car at the Chicago show was equipped with Jiffy curtains. This was an error as the car was equipped with Collins curtains which the Lexington company has adopted as standard for 1914.

Banquet tendered to the electric vehicle makers, dealers and Exide battery distributors by the Electric Storage Battery Co. in Chicago

During the Chicago automobile show the salesmen and dealers of the Studebaker Corp. held a rousing reunion and banquet, at which production and selling plans for the coming season and for 1915 were discussed

Local Shows—Sales at Montreal $250,000

MONTREAL, QUE., Feb. 2—Seen late Saturday at the close of the first week of the Montreal show, T. C. Kirby, manager of the show, and those of the directors present were enthusiastic over the great success of what each of them termed the greatest show that Montreal has yet seen.

All Saturday interest showed no abatement, over 5,000 visitors passing in after four o'clock, despite the inclement weather and the counter attractions. This number, added to the figures already published, makes a grand total of over 40,000 visitors during the show, and speaks well for success of future shows similarly conducted.

From a scrutiny during the week and figures given on Saturday night, the total sales could not be less than $250,000. One firm alone sold thirty-four cars to persons residing in or near Montreal, showing a list of purchasers for verification.

Grand Rapids Show Opens February 9

GRAND RAPIDS, MICH., Feb. 2—Thirty-five makes of gasoline pleasure cars, some presenting as many as ten models, six electric lines and fourteen motor truck exhibits will be shown at Grand Rapids fifth annual automobile show, to be held in the Klingman Furniture Exposition building February 9 to 14, inclusive. This is a greater variety than was offered at the recent show given by the dealers in Detroit, the hub of the world's automobile wheel.

The accessories exhibits greatly outnumber those of any previous local show, and include everything from a spark-plug to a steel body. The motorcycle display will show the products of nine factories. Cyclecars will make their appearance for the first time on a local showroom floor, two lines of the "pocket editions" having taken space.

Minneapolis Show a Success

MINNEAPOLIS, MINN., Jan. 31—Interest shown in the seventh annual show of the Minneapolis Automobile Trade Assn., January 31-February 7 at the National Guard Armory and its annex indicates that any pessimism prior to the opening of the big event was apparently unfounded. The attendance is large, the exhibits themselves are more extensive and complete and the buying interest is as great as in former years if the early days of the show are the proper criterion.

Altogether 75,000 square feet of space has been provided, 5,000 more than last year. The addition space was obtained by boarding over the seat section in the Annex. Extra expense was assumed by the show management this year to attract visitors to the show, better musical programs were arranged, and an elaborate campaign of advertising through the territory tributary to Minneapolis was carried out. This includes Minnesota, the Dakotas, Montana, western Canada, northern Michigan, western Wisconsin and northern Iowa. To insure interest on the arrival of the prospective purchasers and dealers the latest types of cars were installed at the show, the makers and agencies vieing in the details of elaborate display of the machines. The cyclecar was made much of in the arrangements, and four of the new machines were displayed.

Importance of Minneapolis as distributing point for motor cars is contained in the local census just completed of manufacturers and branches and agents. Three concerns manufacture trucks, and one a cyclecar. There are eleven factory branches selling pleasure cars, five branches which sell commercial cars exclusively, and five that handle trucks with pleasure cars. Forty-one dealers handle automobiles and there are seven electric car branches and agencies and seventeen agencies which carry trucks with pleasure cars.

St. Joseph Show Opened February 4

ST. JOSEPH, MO., Jan. 29.—The local automobile show will be held in the Auditorium on February 4-7, the main arena, 200 by 100 feet, together with the assembly hall, 50 by 100 feet, will be used exclusively for pleasure cars, and all space is now sold. The trucks will be shown in the east lobby of the Auditorium and the accessories in the west lobby.

The city of St. Joseph is in the center of the wealthiest and most prosperous section of northwest Missouri, northeast Kansas and southeast Nebraska. It has a large wholesale trade, and being the center of nine roads makes it a large distributing point. There are no factories in this city allied with the automobile industry.

St. Louis Supports Two Shows

ST. LOUIS, MO., Jan. 31.—That St. Louis can afford two automobile shows a year is shown by the fact that already, and with most of the dealers out of the city at other automobile shows, nearly all the available space in the Coliseum is sold.

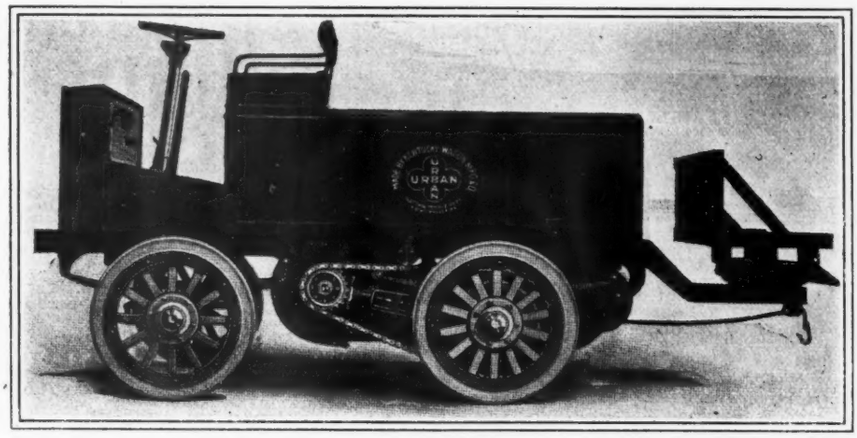
The Coliseum show, February 9 until the 15th, is composed of the dealers who were excluded from exhibiting at the St. Louis Dealers' and Manufacturers' Association show at the Highlands last Fall.

Buffalo's Twelfth Annual Show Opens

BUFFALO, N. Y., Feb. 3—Eight thousand persons attended last evening in Buffalo the opening of the 12th annual automobile exhibition here in Broadway Auditorium. Cars representing an aggregate value of $1,500,000 were shown in the hall. Fifty automobile firms had exhibits. The show for pleasure cars will conclude Saturday night and next Monday evening the annual commercial truck exhibition will be opened. This exhibition also will be continued for one week.

PORTLAND, ORE., Jan. 26—Upwards of 100 machines of the 1914 model, both touring car and truck, made their bow before a large audience at the opening on January 28 of the fifth annual exhibition in Portland, under the management of the Portland Automobile Trade Assn.

NEW YORK CITY, Feb. 3—A creditors' meeting of the recently bankrupt S. & M. M. C. Co., Detroit, will be held Feb. 9.



The new Urban electric lumber tractor made by the Kentucky Wagon Mfg. Co.

Urban Electric Adds a Tractor

Is Used with the Conventional Two-Wheeled Lumber Buggy As a Trailer of 3 Tons Capacity

LOUISVILLE, KY., Jan. 31—The Kentucky Wagon Mfg. Co. has added a lumber tractor to its line of Urban electric vehicles. It is used in connection with the conventional type of two-wheel lumber buggy, the front end of the load resting on the rear end of the tractor. The towing rope is hooked through a binding chain on the front end of the lumber, thus securing it firmly on a bolster. The carriage or bolster turns in a complete circle on its base, making it possible for the lumber buggy to trail easily when turning sharp corners and permitting the lumber to be lowered onto the bolster irrespective of the relative positions of the tractor and the lumber buggy. Special applications may be made where four-wheel buggies are used.

Owing to the short wheelbase the driver can turn on a tramway of ordinary width and with a loaded lumber buggy trailing can move with ease through congested parts of a plant. The battery furnished is sufficient to operate the tractor without recharging for more than 10 hours. It is mounted on top of the frame and back of the driver's seat. The motor, which is of General Electric Co. make, is suspended from the frame and drives to the countershaft through a Morse silent chain, running in an oil-tight chain case. The countershaft is mounted on Hess-Bright bearings and incloses the differential to which the main driving gear is bolted. Roller side chains drive from the countershaft sprockets to the rear wheels.

The controller is of the continuous torque type and is mounted in the shroud directly in front of the driver's seat. The controller has four speeds forward and two reverse. Axles are of heavy hammer-forged construction with the wheels running on Timken bearings. Artillery wheels with solid rubber tires are used. Springs are semi-elliptic bronze bushed in the eyes and secured in their shackles by pack-hardened bolts ground true to size and fitted with grease cups.

The brake is pedal-operated, while the steering gear is semi-reversible, of the worm and nut type with large bearing surface. When used, the towing motor is suspended from the frame immediately behind the rear axle. The frame is of pressed steel of high carbon stock. The lumber carriage is supported on an extension of the frame and is mounted on a cast-iron swivel base.

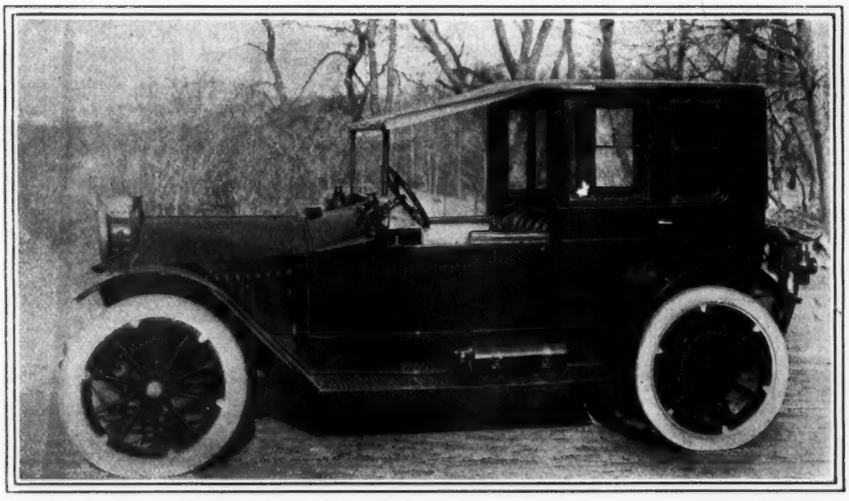
Specifications follow: Capacity, 3 tons trailing; speed, 9 miles per hour when drawing load, 12 miles per hour empty; weight, about 4,500 pounds; overall length, 154 3-4 inches; overall width, 71 inches; wheelbase, 58 1-4 inches; tread, 57 inches; battery, standard equipment, forty-four cells, 17 M. V. Hycap-Exide; Motor, G. E. 1022, 85 volts, 40 amperes, 1200 revolutions per minute; tires, 32 by 4 inch front and rear on S. A. E. standard rims; turning radius, 15 1-2 feet; lumber carriage, 47-inch width inside. Equipment: Sangamo ampere-hour meter. Bell with foot push button. Leather back for driver's seat.

Attractive Detachable Town Car Body for Hupmobile Chassis

NEW YORK CITY, Jan. 31—One of the most attractive detachable bodies designed by Chas. E. Riess, president of Chas. E. Riess & Co., Inc., 1690 Broadway, distributors of the Hupmobile, is that illustrated herewith.

With this body, it is possible to convert an open Hupmobile touring car into an ideal and luxurious town car, simply by removing the touring top and attaching the auxiliary body onto the regular body. A feature which adds to the attractiveness of this useful addition to a Hupmobile car is that a complete change from the open to the closed body can be accomplished in about 20 minutes. Moreover, the use of this top does not in any way mar the standard body.

The extra body is substantially constructed of metal, handsomely finished and lined with whipcord. A clever equalizing device has been worked out so that the extension body fits with the regular door, making one unit.



New detachable town car body designed by Chas. E. Riess for Hupmobile chassis

FORD plant in St. Louis—In an effort to standardize the price of the Ford Automobile Henry Ford, president of the company that bears his name, announces he will open an assembling plant in St. Louis, Mo., about April 1. The profit-sharing wage scale, a minimum of $5 daily, will apply to the local plant, the employees of which will be selected from the local mechanical fields. J. W. Wright, assistant manager of the St. Louis Ford branch, said price standardization was the first thought of the company in opening a local factory. He said knocked down parts could be shipped much cheaper than a complete car. As it is a Ford car cost $550 fo.b. Detroit, which with the charges for freight makes the cost to the buyer $567. It is the company's plan, Wright said, to open assembling plants in several different cities in the Middle West.

Electric Service Supply Adds—The Electric Service Supply Co., Philadelphia, Pa., manufacturer of automobile accessories, will erect an addition to its factory at an estimated cost of about $50,000.

Allen's Reception at Plant—The Allen Motor Co., Fostoria, O., gave a reception at its plant recently to show how the Allen car is constructed. The various parts that go to make up an automobile were put together before the eyes of the audience and the process explained in detail.

Occupies Old Royal Tourist Plant—The Yuster Axle Co., recently incorporated for $200,000 in Cleveland, O., has opened a factory in the old Royal Tourist plant, East 72d street and Lake Shore Railroad. Automobile axles will be made.

May Build Plant in Indianapolis—Pierce Underwood, representing the Woods Mobilette Co., Chicago, Ill., has been in Indianapolis, Ind., investigating the feasibility of establishing the company's factory in that city. A decision is to be reached within 30 days. A temporary plant will be occupied pending the construction of permanent factory buildings. The company is capitalized at $2,500,000 and is reported to have orders for 10,000 cyclecars.

Automobile Plant for Greenville.—Another manufacturing industry will be introduced into Greenville, S. C., about February 1, when an automobile factory, with a capacity of 2,000 machines a year, will locate there, according to the plans of the Victor M. C. Co. This plant has been operating in Philadelphia for the past 14 months. The capital stock of the company is $100,000. The incorporators of the new company are: A. G. Dale, O. M. Mauldin and C. V. Stahl.

Morton In New Plant—The Morton Truck and Tractor Co., Harrisburg, Pa., has purchased the three-story brick building on 19th street, formerly occupied by the Model Typewriter Co., and will move into it in the near future. The company will build the heavy truck it now handles. The building, which is practically new, will be remodeled and will afford ample facilities for the Morton company. The factory is located along the tracks of the Philadelphia & Reading railway. The capital stock of the Morton Truck and Tractor Co. has been increased from $250,000 to $300,000.

Canada's First Tire Fabric Plant.—The first plant in Canada to be devoted entirely to the manufacture of tire fabric will be in operation at the end of January, when the Canadian Connecticut Cotton Mills, Ltd., will place its new big mills in operation at Sherbrooke, Que. The new Canadian company has closely associated with it the interests that had very successful results with the Connecticut Mills Co., Inc., which manufactures tire fabric requirements of a number of the larger tire manufacturers of the U. S. It is the intention that the new Canadian company should specialize in turning out the requirements of the larger Canadian companies. Four of the six large tire manufacturers in Canada are its customers, including the Goodyear, Dominion, Dunlop and the Independent companies.

The Automobile Calendar—Shows, Meetings, Etc.

Jan. 31-Feb. 7	Minneapolis, Minn., Automobile Show.
Feb.	Hartford, Conn., Show.
Feb.	St. Louis, Mo., Show.
Feb. 2-7	Buffalo, N. Y., Automobile Show, Buffalo Automobile Dealers' Assn.
Feb. 3-7	Kalamazoo, Mich., Show.
Feb. 3-7	Montreal, Que., Motor Truck Show, Montreal Automobile Trade Assn.
Feb. 4-7	St. Joseph, Mo., Annual Show, St. Joseph Auditorium, St. Joseph Automobile Show Assn.
Feb. 9-14	Seattle, Wash., Annual Automobile Show, State Armory Bldg., W. I. Fitzgerald, Manager.
Feb. 9-14	Buffalo, N. Y., Truck Show, Buffalo Automobile Dealers' Assn.
Feb. 9-14	Grand Rapids, Mich., Fifth Annual Western Michigan Show, Klingman Furniture Exposition Bldg., *Grand Rapids Herald.*
Feb. 9-14	Buffalo, N. Y., Commercial Car Show, Buffalo Automobile Dealers' Assn.
Feb. 9-14	Portland, Me., Second Annual Show, Dealers' Assn.
Feb. 11-14	Geneva, N. Y., Automobile Show, State Armory.
Feb. 11-14	Louisville, Ky., Show, First Reg. Armory, Dealers' Assn.
Feb. 14-21	Pittsburgh, Pa., Automobile Show, Pittsburgh Auto Show Assn.
Feb. 16-22	Kansas City, Mo., Auto Show.
Feb. 16-21	Toronto, Ont., Automobile Show, E. M. Wilcox.
Feb. 17-21	Salt Lake City, Utah, Automobile Show, W. D. Rishel.
Feb. 18-21	Easton, Pa., Automobile Show.
Feb. 18-21	Bloomington, Ill., Automobile Show, McLean County Automobile Club.
Feb. 18-21	Albany, N. Y., Passenger Car Annual Show, State Armory, Albany Auto Dealers' Assn.
Feb. 21	Santa Monica, Cal., Vanderbilt Cup Race.
Feb. 21-28	Newark, N. J., Automobile Show, N. J. Auto Trade Assn.
Feb. 21-28	Cincinnati, O., Automobile Show, Cincinnati Automobile Dealers' Assn.
Feb. 23	Santa Monica, Cal., American Grand Prix.
Feb. 23-25	Albany, N. Y., Commercial Show.
Feb. 23-28	Indianapolis, Ind., Auto Show, Indianapolis Auto Trade Assn.
Feb. 23-28	Omaha, Neb., Automobile Show, Omaha Automobile Assn.
Feb. 24-28	Syracuse, N. Y., Automobile Show, State Armory, Syracuse Automobile Dealers' Assn.
Mar. 2-4	Cincinnati, O., Commercial Vehicle Show, Cincinnati Automobile Dealers' Assn.
Mar. 2-7	Sioux City, Ia., Show, New Auditorium Bldg., Sioux City Auto Club Assn.
March 2-7	Utica, N. Y., Show, Automobile Club, W. G. Comstock, Mgr.
Mar. 3-7	Fort Dodge, Ia., Show, Fort Dodge Auto Dealers' Assn.
	Tiffin, O., Show, *Tiffin Advertiser.*
Mar. 7-14	Hamilton, Ont., Passenger and Truck Show.
Mar. 7-14	Boston, Mass., Automobile Show.
Mar. 9-14	Des Moines, Ia., Show, Des Moines Automobile Dealers' Assn.
Mar. 17-21	Boston, Mass., Truck Show.
Apr. 9-15	Manchester, N. H., Automobile Show.
May 30	Indianapolis, Ind., 500-mile Race, Indianapolis Motor Speedway.
July 3-4	Tacoma, Wash., Road Races. Tacoma Carnival Assn.
July 4	Sioux City, Iowa, 300 Mile Race, Sioux City Auto Club and Speedway Assn.
July 4	Lyons, France, French Grand Prix.
July 13-14	Seattle, Wash., Track Races, Seattle Speedway Assn.
July 25-26	Belgium Grand Prix Road Races.
Aug. 28-29	Chicago, Ill., Elgin Road Races, Chicago Automobile Club.
Sept. 9	Corona, Cal., Road Race, Corona Auto Assn.
November	El Paso, Tex., Phoenix Road Race, El Paso Auto Club.

The Week in the Industry

Motor Men in New Roles

RUSHMORE Sails for Turin—S. W. Rushmore of the Rushmore Dynamo Wks., Plainfield, N. J., sailed on January 31 for Turin, Milan, Paris and London, where it is expected that contracts will be made for the European manufacture of the Rushmore electric starter and dynamo. The following are fitted by their American importers with the Rushmore system: DeDion-Bouton, Mercedes, Isotta-Fraschini, Delaunay-Bellville and the Austrian Daimler.

Boyer Joins Franklin in Frisco—G. A. Boyer has joined the J. F. McLain Co., Franklin dealer in San Francisco, Cal.

White Heads Detroit Stromberg—Charles White has been placed in charge of the Detroit office of the Stromberg Motor Devices Co., Chicago, Ill. He has been appointed manager.

Hood Resigns from Empire—Wallace Hood has resigned as sales manager of the Empire Automobile Co., Indianapolis, Ind. He has returned to his old home in Detroit and will affiliate with a Detroit company.

Corlew Resigns from Cameron—F. S. Corlew has resigned his position as sales and advertising manager of the Cameron Mfg. Co., New Haven, Conn., to accept a position as sales manager of the Euclid M. C. Co., New York City, manufacturer of the Euclid cyclecars.

Brown Resigns from Studebaker—Scott Brown, general counsel and secretary of the Studebaker Corp., Detroit, Mich., has resigned. He was formerly general counsel and secretary of the Studebaker Bros., South Bend., Ind., and later of the Studebaker Automobile Co.

Rothermel Continental's Foreign Representative—R. A. Rothermel has been engaged by the Continental Motor Mfg. Co., Detroit, Mich., as its foreign representative, with his headquarters in Paris. The company expects to compete with foreign motor makers in their home territory.

Death Claims R. N. Dyer—R. N. Dyer, brother of L. H. Dyer, died on January 16. The latter is well known to the automobile trade because of the Dyer patents held by the Enterprise Automobile Co., of which he is the head. The law firm will be known henceforth as Dyer & Taylor.

Kelley and Carples Form Partnership—P. J. W. Kelley, formerly with the Splitdorf Electrical Co., has entered into partnership with J. M. Carples for the purpose of handling the English Beatonson specialties, manufactured by George Beaton & Co., London, Eng. They will do business as the Kelley Co.

Van Brunt with Palmer-Moore—H. D. Van Brunt, New York City, has become export agent for the Palmer-Moore Co., Syracuse, N. Y., and will handle the entire exports of the Palmer-Moore two-cycle air and water-cooled trucks in foreign countries, save in Canada. William Crowle, of Adelaide, South Australia, has taken the agency for his country.

New Premier Appointments—Following the resignation of H. H. Hewitt as treasurer and purchasing agent of the Premier Motor Mfg. Co., Indianapolis, Ind., E. E. Westman has been appointed purchasing agent and Ferd Barnickol has become treasurer. Mr. Westman formerly was with the Cole M. C. Co., Indianapolis, Ind.

Schaefer with Flint Varnish Wks.—A. E. Schaefer, formerly president of the Abbott Motor Co., Detroit, Mich., has become manager of the railway department of the Flint Varnish Wks., Flint, Mich. Before entering the automobile industry Schaefer was with the Sherwin Williams Paint Co., of which he was sales manager when he left to form the Ohio M. C. Co.

Page Mgr. New Departure—DeWitt Page, who has also been identified with the New Departure Mfg. Co., Bristol, Conn., as secretary, sales manager, purchasing agent and advertising manager, has been appointed general manager. C. T. Treadway, who for some years past has been treasurer of the company, continues in that capacity but also becomes chairman of the board of directors.

D. McCall White Leaving for America—D. McCall White, A. M. I. mechanical engineer, M. I. A. E., formerly associated with the designs of the Daimler Motor Co., at England and late works manager of its plant in Naples, Italy, also late designer and assistant manager of the Napier Motor Co., London, has resigned his position as works manager of the Crossley Motor Co., Manchester, and will arrive in New York per the Lusitania which left Liverpool on January 31. Any communications will reach him addressed, care of the Society of Automobile Engineers, 1790 Broadway, New York City.

Garage and Dealers' Field

NEW R. & L. BLDG.—The R. & L. Co., eastern distributor for Garford and Willys utility trucks, has made arrangements for the erection of another service building, this one being intended for Brooklyn and Long Island owners. The location is at Atlantic and New York avenues, Brooklyn, in close proximity to the Brooklyn branch of the company, at Fulton street and Bedford avenue. The plot is 60 by 100 feet, and the building will occupy the entire premises. It will be of fireproof construction, without posts, suitable for motor truck purposes.

Piedmont Garage in Anderson—The Piedmont Garage has opened in Anderson, S. C., in charge of W. E. Watson.

Gray & Davis "Starter" Makes Appearance—The first issue of *The Starter* has made its appearance. This is published by Gray & Davis, Boston, Mass. The editor is C. O. Shacks, advertising manager.

King Moves in Boston—The sales and service department of the King Co. is to be moved in Boston, Mass., shortly from the present location on Boylston stree to a new building being finished on Brighton avenue, near the home of the Packard.

Big Packard Truck Order—An order for twenty-four heavy duty Packards was received from the Loose-Wiles Biscuit Co., New York City. This involves an expenditure of about $75,000. The purchase calls for eleven 3-ton vehicles, while the remainder are of 2-ton capacity.

May Name County Roads—L. W. Mitchell, road superintendent for Marion County, in which Indianapolis, Ind., is located, is working out a scheme of naming all county roads. Where these roads are on a line with Indianapolis streets, they will be given the name of the street. It is thought that the system of naming highways will prove of great value to motorists.

New Motor Using Kerosene—The Kahlenberg Bros. Co., of Two Rivers, Wis., manufacturing gasoline motors for marine purposes, has perfected a compact motor utilizing kerosene as a fuel and in addition to building it for power boats and yachts, may issue several designs adapted for pleasure car and truck use. The company has been working on the kerosene motor for two years.

Cyclecars for Jersey Police—New Jersey seems to have been the first State to have considered the newest form of motor vehicle propulsion, the cyclecar. Recently the town of Teaneck, N. J., voted to appropriate $3,500 for a police force of three men, and to equip them with motorcycles or cyclecars. The chairman of the township committee is now corresponding with the Imp Cyclecar Mfg. Co. Auburn, Ind., on the question of equipping the police force with that make of cyclecar.

New Booklet Issued by E. V. A.—Of great value to owners of electric vehicles issued by the N. Y. Electric Vehicle Assn., is the new booklet of information about charging stations within 150 miles of New York, together with a route map. Among the useful facts compiled and printed for the first time in this booklet are the prices charged for boosting, the hours during which service is available, and the maximum amperage and voltage.

Another Automobile Insurance Co.—At the annual meeting of the Farmers' Mutual Fire Insurance Co., of Menomonie, Wis., it was decided to engage in the business of insuring motor cars against fire and theft. The company insures farm property exclusively and the remarkable growth in the number of motor cars owned by farmers created a demand for policies of this class. It is the first farmers' mutual in Wisconsin to write motor car business. The company has approximately $6,000,000 of insurance in force.

New Agencies Established During the Week

PLEASURE VEHICLES

Place	Car	Agent
Abbotsford, Wis.	Maxwell	Gelhaus Bros.
Albuquerque, N. M.	Haynes	Albuquerque-Haynes Motor Sales Co.
Almond, Wis.	Maxwell	Hetzel, Justeson & Brochnow
Amarillo, Tex.	Maxwell	W. E. Groendycke.
Ambler, Pa.	Haynes	Ambler Garage.
Anna, Ill.	Metz	R. Tuthill.
Antigo, Wis.	Maxwell	Reed & Duval Co.
Appleton, Minn.	Maxwell	Appleton Auto Co.
Arena, Wis.	Maxwell	O. E. Holly.
Arlington, Ga.	Maxwell	R. N. Bostwick.
Armour, S. D.	Haynes	Loeffler & Edwards.
Athens, O.	Franklin	C. H. Welch.
Atkinson, Neb.	Maxwell	C. E. Havens.
Atlantic City, N. J.	Maxwell	Bateman Machine Co.
Augusta, Me.	Haynes	W. S. Ladd.
Avoca, Ia.	Oakland	Avoca Auto & Supply Co.
Babylon, N. Y.	Maxwell	Babylon Garage, Inc.
Bainbridge, Ga.	Haynes	Caldwell M. C. Co.
Bartow, Fla.	Oakland	F. M. Bass.
Battle Creek, Mich.	Maxwell	United Motors Co.
Bayshore, L. I., N. Y.	Maxwell	Capron Co.
Bel Air, Md.	Maxwell	C. R. Grafton.
Benson, Minn.	Maxwell	Ed. Arneson.
Bentonville, Ark.	Maxwell	Bohart-Powelson Hdw. Co.
Birmingham, Ala.	Moon	O. M. Graham.
Bloomfield, Neb.	Haynes	H. A. Dahl.
Boston, Mass.	Jeffery	C. P. Rockwell, Inc.
Boston, Mass.	Pathfinder	Pathfinder M. C. Co.
Boston, Mass.	Saxon	Whitten-Gilmore Co.
Brandon, Minn.	Maxwell	Larson & Drexler.
Brenham, Tex.	Maxwell	F. C. Leesch.
Brunswick, Neb.	Maxwell	Rose & Rasmusson.
Buffalo, N. Y.	Briscoe	C. F. Monroe.
Burlington, Ia.	Maxwell	Sutter & Gamble.
Caldwell, O.	Maxwell	Radcliff & Son.
Calgary, Alberta	Maxwell	T. E. Jackson.
Cambridge, Md.	Maxwell	C. T. Mace.
Camden, N. J.	Hupmobile	Reeves Gar. & Motor Co.
Camden, N. J.	Lozier	Reeves Gar. & Motor Co.
Camden, N. J.	Paige-Detroit	Reeves Gar. & Motor Co.
Cape Girardeau, Mo.	Hupmobile	Southeastern Motor Co.
Charles City, Ia.	Westcott	Theno Auto Co.
Charlotte, N. C.	Haynes	Haynes Dis. Co.
Chaska, Minn.	Maxwell	Ess Bros.
Chattanooga, Tenn.	Maxwell	Chattanooga M. C. Co.
Chico, Cal.	Haynes	T. H. Morgan.
Claire City, S. D.	Maxwell	Claire City Auto & Mach. Co.
Clarinda, Ia.	Oakland	O. B. Holton & Son.
Clearfield, Pa.	Maxwell	Routch & Swartzle.
Clinton, Ind.	Haynes	Clinton Auto Co.
Columbus, O.	Davis	Jacob Renner.
Columbia, Wash.	Ford	Dahlen Auto Co.
Columbus, O.	Haynes	P. H. Rogers M. C. Co.
Cynthiana, Ky.	Haynes	Cynthiana Carriage Co.
Dayton, Tex.	Maxwell	C. A. Brown.
Decorah, Ia.	Haynes	Peter Johnson & Sons.
Du Bois, Pa.	Haynes	Johnston Garage, Inc.
Durand, Wis.	Maxwell	Bowman & McMahon.
Earling, Ia.	Oakland	F. E. Wilmerding.
Edina, Mo.	Maxwell	Crabbe & Kelly.
Edmonton, Alb.	Haynes	Fourteenth St. Garage Co.
Edna, Tex.	Maxwell	I. W. Brickel.
El Campo, Tex.	Maxwell	Oscar Shultz.
Eldorado, Ia.	Maxwell	W. P. Lauer.
Fairmont, W. Va.	Maxwell	Standard Garage Co.
Fort Dodge, Ia.	Westcott	P. J. Tierney.
Franklin, Wash.	Ford	Dahlen Auto Co.
Frederick, Md.	Haynes	Chester Kemp.
Findlay, O.	Chevrolet	C. L. Fifer.
Findlay, O.	Hupmobile	C. C. Greeger.
Fort Worth, Tex.	Oakland	Detroit Elec. & M. C. Co.
Fulton, N. Y.	Haynes	R. D. Piper.
Gaylord, Minn.	Maxwell	Mueller Bros.
Garfield, Wash.	Ford	Dahlen Auto Co.
Gilroy, Cal.	Maxwell	McKinney Bros.
Glasgow, Ky.	Buick	Bradford Bros.
Granite Falls, Minn.	Maxwell	A. W. Winter.
Gravity, Ia.	Oakland	C. S. Oswald.
Gray, Ga.	Maxwell	C. W. Glausier.
Greenville, N. C.	Haynes	L. A. Randolph Co.
Griswold, Ia.	Oakland	G. S. Schuler.
Groton, Mass.	Maxwell	J. F. Peabody.
Hammond, Ill.	Haynes	E. B. Leabitt.
Hankinson, N. D.	Maxwell	Hankinson Auto Co.
Hartford, Conn.	Chevrolet	New England Garage.
Hartford, Conn.	Locomobile	Buick Garage Co.
Hartford, Ky.	Maxwell	Carson & Pate.
Harvard, Ill.	Haynes	Manley Hdw. Co.
Hecla, S. D.	Maxwell	Sandberg & Dinger
Hempstead, Tex.	Maxwell	Wm. Wagnon.
Hillsboro, O.	Buick	Currie M. C. Co.
Huntington, W. Va.	Ford	Motor Sales Co.
Hordville, Neb.	Oakland	Hordville Implement Co.
Huntsville, Ala.	Moon	O. M. Graham.
Indianapolis, Ind.	Haynes	H. L. Archey.
Iona, Minn.	Haynes	C. Gehleen.
Jewett, Tex.	Maxwell	Jewett Land Co.
Johannesburg, S. Africa.	Franklin	So. African Gen. Elec. Co.
Kansas City, Mo.	Packard	W. J. Parrish & C. A. Forster
Keyser, W. Va.	Maxwell	T. H. Davis.
Kingsley, Ia.	Oakland	O. S. Pixler.
Kingsville, Ont.	Maxwell	William Fleming.
La Crosse, Wis.	Haynes	T. T. Bergh.
La Crosse, Wis.	Maxwell	Rybold & Weihaupt.
La Grange, Tex.	Maxwell	La Grange Auto Co.
La Harpe, Ill.	Haynes	J. F. Fox.
Lawrenceburg, Ky.	Buick	Strange, Hawkins & Witherspoon.
Lebanon, Pa.	Maxwell	Steitz M. C. Co.
Leigh, Neb.	Maxwell	Leigh Motor Co.
Linesville, Pa.	Maxwell	Linesville Garage Co.
Linwood, Neb.	Oakland	Stava & Franklin.
Louisville, Ky.	Mitchell	Ruby Carriage Co.
Louisville, Ky.	Studebaker	Bywater-Ortner Motors, Co.
Loup City, Neb.	Maxwell	Blaska & Woznick.
Madison, Wis.	Haynes	Knipprath M. C. Co.
Madison, Minn.	Maxwell	J. F. Jacobson Implement Co.
Manitoba, Can.	Imperial	Gt. Western Motor Car Co.
Manitoba, Can.	Krit	Gt. Western Motor Car Co.
Marion, Va.	Maxwell	Marion Hdw. Co.
Martinsburg, W. Va.	Haynes	Martinsburg Auto Co.
Mason City, Ia.	Haynes	J. Lyons.
Maysville, Ky.	Maxwell	Mike Brown.
Millville, N. J.	Maxwell	Conover & Whitaker.
Milwaukee, Wis.	Chevrolet	Frint M. C. Co.
Milwaukee, Wis.	Jackson	Kittleman-Sherman Garage.
Milwaukee, Wis.	National	Hughes M. C. Co.
Milwaukee, Wis.	Paterson	Wait Automobile Co.
Minerva, O.	Maxwell	Minerva Hdw. Mfg. Co.
Minneapolis, Minn.	Crow-Elkhart	A. R. Curtis.
Minneapolis, Minn.	Lewis	A. R. Curtis.
Minneapolis, Minn.	McFarlan	J. P. Snyder Co.
Minneapolis, Minn.	Monarch	H. S. Haynes M. C. Co.
Minneapolis, Minn.	Oldsmobile	Fawkes Auto. Co.
Minnesota Lake, Minn.	Maxwell	Peter Kremer Hdw. Co.
Mobile, Ala.	Maxwell	Central Auto Co.
Mobile, Ala.	Moon	A. W. Brooks.
Monon, Ind.	Maxwell	Thackers Garage.
Montreal, Que.	Case	Gadbois Ltd. Co.
Montreal, Que.	Metz	Gadbois Ltd. Co.
Montreal, Que.	Oakland	Leger & St. Pierre.
Montreal, Que.	Palmer-Singer	Gadbois Ltd. Co.
Moose Jaw, Sask.	Maxwell	H. B. Annable.
Morris, Minn.	Maxwell	Stone Implement Co.
Morton, Minn.	Maxwell	Mertz & Hale.
Moultrie, Ga.	Maxwell	R. M. Morrison.
Mt. Pleasant, Pa.	Haynes	McCurdy Auto Co.
New Albany, Ind.	Oakland	J. O. Endrie, Jr.
New Orleans, La.	Haynes	C. F. Spence.
New Orleans, La.	McFarlan	Cass Sales Co.
New Paris, Ind.	Maxwell	Werner & Mishler.
New York Mills, Minn.	Maxwell	I. H. Mursu.
Norfolk, Neb.	Maxwell	H. C. Sattler.
Norwalk, Conn.	Maxwell	F. E. Lockwood & Co.
Norristown, Pa.	Maxwell	C. R. Henricks.
Ogdensburg, N. Y.	Maxwell	H. G. Chandler.
Oklahoma City, Okla.	Maxwell	Wheatly & Sharp.
Oneida, N. Y.	Maxwell	Oneida M. C. Co.
Orleans, Neb.	Oakland	Lindeen Hdw. Co.
Ottumwa, Ia.	Haynes	Wapello Auto Co., Inc.
Owensboro, Ky.	Oakland	Weill & Braynham.
Peekskill, N. Y.	Herreshoff	H. F. Griffin.
Petersburg, Va.	Haynes	Central M. C. Co.
Phœnixville, Pa.	Maxwell	E. C. Meier.
Pittsfield, Mass.	Maxwell	Lowe, Tower & Otseyee.
Plant City, Fla.	Maxwell	Parrish & Crabb.
Plattsburg, N. Y.	Maxwell	H. J. Morse.
Pocahontas, Ill.	Metz	S. E. File.
Ponce De Leon, Fla.	Maxwell	L. H. Hughes.
Poplar Bluff, Mo.	Richmond	Reliable Motor Co.
Quincy, Ill.	Maxwell	Machinery & Motor Co.
Rawlins, Wyo.	Maxwell	H. A. France.
Reno, Nev.	Haynes	J. E. Threlkel.
Rheese, Pa.	Haynes	Landis Bros.
Richfield, Wis.	Maxwell	Richfield Maxwell Motor Co.
Ridgetown, Ont.	Maxwell	Charles Padburg.
Ringsted, Ia.	Maxwell	Ringsted Auto Co.
Rochelle, Ga.	Maxwell	Rochelle Auto Co.
Rodney, Ont.	Maxwell	W. N. Lusty.
Romulus, Mich.	Maxwell	John Petrasky.
Rutland, Vt.	Maxwell	R. V. Allen.
Salem, Ind.	Grant	Salem Motor Co.
San Francisco, Cal.	National	S. G. Chapman.
San Francisco, Cal.	Packard	Rene J. Marks Co.
Sandusky, O.	Haynes	F. Brost & L. Weier.
San Luis, Cal.	Maxwell	Cal. Garage.
Sebastian, Fla.	Moon	R. G. Hardee.
Sheboygan, Wis.	Maxwell	E. & M. Motor Co.
Shickshinny, Pa.	Haynes	J. D. Woodworth's Sons.
Sioux Falls, S. D.	Maxwell	C. O. Armstrong.
Simpsonville, Ky.	Westcott	Farmers Supply Co.
Sioux City, Ia.	Maxwell	Hoeven Auto Co.
Sisseton, S. D.	Haynes	Teigen Bros.
So. Brownsville, Pa.	Haynes	Dr. A. C. Smith.
Springfield, O.	Franklin	C. E. Jordan.
Springfield, Ill.	Haynes	City Garage.
Springfield, Mass.	Haynes	Springfield Auto Co.
St. Petersburg, Fla.	Maxwell	C. B. Haines.
Superior, Wis.	Studebaker	Allen Peck & Co.
Tacoma, Wash.	Maxwell	P. Leonard & Sons.
Tampa, Fla.	Maxwell	Pexa & Kallauner.
Terre Haute, Ind.	Haynes	Clinton Auto Co.
Tiffin, O.	Maxwell	J. A. Manacke.
Toledo, O.	Detroiter	W. H. McIntyre.
Toronto, Ont.	Haynes	S. J. Murphy.
Toledo, O.	Jeffery	W. H. McIntyre.
Toledo, O.	Lyons	W. H. McIntyre.
Toledo, O.	Partin-Palmer	L. W. Morris.
Toledo, O.	Saxon	Union Supply Co.
Tom's Brook, Va.	Maxwell	Snarr & Miley Co.
Toronto, Ont.	Havers	The Weldon Motor Car Co.
Toronto, Ont.	Moon	Progressive Tire Co.
Trenton, N. J.	Haynes	Tossan Bros.
Turlock, Cal.	Maxwell	A. C. Rapp.
Umatilla, Wash.	Ford	Dahlen Auto Co.
Valdosta, Ga.	Maxwell	J. N. Swindell.
Vanduser, Ill.	Metz	I. H. Joyce.
Vermillion, S. D.	Haynes	Thompson-Lewis Co.
Vienna, S. D.	Maxwell	J. G. Eggen.